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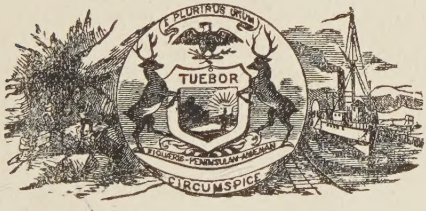
HUBBELL HALL

State of Michigan

Mines

and

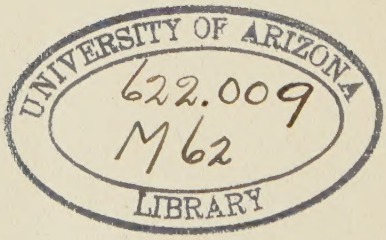
Mineral Statistics



By James L. Nankervis
Commissioner of Mineral Statistics.

BY AUTHORITY.

GAZETTE PRINT, HOUGHTON, MICH.



LETTER OF TRANSMITTAL

STATE OF MICHIGAN
Office of
Commissioner of Mineral Statistics

Calumet, April 1, 1907.

HON. FRED M. WARNER,
GOVERNOR OF THE STATE OF MICHIGAN:

Sir:— In fulfillment of the duties of my office, I have the honor to submit herewith the following report upon the mines and mineral interests of the State for the year ending March 31, 1907.

Respectfully your obedient servant,
James L. Nankervis,
Commissioner of Mineral Statistics.

56382

Commissioners of Mineral Statistics.

NAME	DATE OF APPOINTMENT	TERM EXPIRED
Charles E. Wright	Feb. 15, 1877	Jan. 12, 1883.
A. P. Swineford	Jan. 12, 1883	April 29, 1885.
Charles D. Lawton	April 29, 1885	Mar. 19, 1891.
James P. Edwards	Mar. 19, 1891	Jan. 10, 1893.
James B. Knight	Jan. 10, 1893	Mar. 28, 1895.
George A. Newett	Mar. 28, 1895	April 1, 1899.
James Russell	April 1, 1899	Mar. 31, 1901
Thomas A. Hanna	April 1, 1901	Mar. 31, 1905.
James L. Nankervis	April 1, 1905	Mar. 31, 1909.

INTRODUCTORY.

In industrial expansion and material growth, 1906 was the most notable year in the history of modern times. Prosperity is practically universal and trade and commerce all over the world continues on an enormous scale. The demand for supplies and products of every description for some time past has been steady, sometimes pressing and urgent, and the volume of business transacted surpasses all previous records. Although plants, factories and other industrial concerns have been operated to the limit of capacity yet they have been unable to keep up with the demand and for nearly all commodities, orders on hand are reported much larger than they were a year ago. Prices of copper, iron, steel and practically everything in the shape of manufactured articles are high, and producing mines as well as other industrial enterprises, are in a prosperous condition and doing well. No country in the world is making greater and more rapid industrial progress than the United States and our own State, Michigan, contributes in a substantial way to the splendid success achieved by the American people.

There was never a period in the world's history when so many manufactured articles were made and sold as within the limits of the United States during 1906 and from present indications, the output for the year 1907 will surpass that of last year. Iron and steel companies, car and locomotive factories, the electric companies and other manufacturers of railway equipment already have orders on their books amounting to upwards of $1,225,000,000, including 340,000 freight cars, 5,000 passenger cars, 6,000 locomotives and $90,000,000 worth of steel rails. Domestic exports last year was equal to an average of $22.50 for every man, woman and child in the United States. It would be difficult to imagine a situation more generally favorable than is the existing condition of trade and commerce and its allied interests today. In every line of industry the productive capacity is forced to the limit, and yet the supply seems inadequate to satisfy the demand. This is shown by the steady increase in prices, advance of wages and delay in deliveries.

Moreover, there is no indication that production will exceed consumption, at least within a reasonable period. The country has grown so enormously in wealth and population that its consuming ability has reached proportions hardly dreamed of a few years ago.

It affords me much pleasure in being able to announce that the previous report appeared to have given general satisfaction. Applications for copies of the work came to this office from practically all over the country and from England and Germany. Many complimentary letters were received, all of which is gratifying, and I am sincerely glad the

work has been appreciated. I have endeavored to prepare this report with just as much care, with the hope of giving the people such a work as may prove useful to them and also full value for the amount appropriated for its preparation and publication.

I have visited, on different occasions, the iron ore mines of the Lake Superior district and have seen what the properties are like, the methods in vogue for taking out products and the mechanical equipments in service. Having lived all my life in the midst of mines and some of them among the most successfully operated ones on the globe, besides having visited various mining camps throughout the country for purposes of observation and investigation, I feel that I ought to be somewhat competent to pass judgment as to whether properties in general are operated in a practical way and whether mechanical equipments in service are adapted for requirements or not.

With but one or two exceptions, all figures regarding products, number of men employed, machine drills operated, depth of shafts, extent of openings and general data are official, up-to-date and may be relied upon as practically correct. Remarks of Iron and Copper mining and their allied interests and the condition of labor in the upper peninsula of Michigan, form the bulk of this report. Industrial enterprises, located in the lower part of the State and the condition of labor, are inspected and reported on annually to the Commissioner of Labor at Lansing by inspectors appointed for the work. These reports are very complete, contain a vast amount of valuable data and form a part of the Annual Report of the Michigan Bureau of Labor and Statistics. Copies of the reports may be secured by addressing applications to the Bureau of Labor, Lansing, Mich. Because of this provision, a compilation of the products made and the number of men employed, followed by a brief summary of results would appear all that is needed or expected from the Commissioner of Mineral Statistics on the Coal, Salt and Cement industries of the State.

Of the iron ore produced in the United States, the mines of the Lake Superior region furnish about 75 per cent while the copper mines of Michigan furnish about 14 per cent of the copper produced and the best brand in the world. These products necessarily exert a powerful influence in the markets of the country and it is but natural that people interested in either of these industries should be anxious to secure any work published on the mineral statistics and resources of Michigan. I wish to express my obligations to all those who have charge of the enterprises referred to in this report. In my visits to the properties and intercourse with managers I experienced nothing but courteous treatment and was afforded every facility for gathering the necessary information for preparing this report. All have my sincere thanks.

COMMISSIONER.

MICHIGAN COLLEGE OF MINES.

This institution offers four years' courses leading to the degree of Engineer of Mines and Bachelor of Science; it also affords facilities for graduate work leading to the degree of Doctor of Philosophy. The engineering department is fully equipped to give courses in all the branches of engineering in which a mining engineer needs to be proficient. Besides the faculty of eight professors, there is a staff numbering 31 assistant professors and instructors. The college year is divided into four terms, the out-door practical work being confined mainly to the summer term.

The Michigan College of Mines at Houghton, is a State institution established by an act of the Legislature of 1885, and opened for reception of students in September, 1886. The college exists for the purpose of training men to take an active part in the development of the mineral wealth of the state and nation, and concentrates its efforts on this particular line of work.

The methods of instruction give great prominence to laboratory work and trips of inspection to plants which exemplify often on a large scale the application of principles taught in the classroom to problems of commercial operation.

It is plain that an engineering school must derive immense advantage from a location in which its immediate surroundings continually illustrate and enforce the principles which it teaches. Even without effort on the part of the school, such environment must serve as an efficient aid to the instruction. But when those in control of these operations are in sympathy with the institution—are ready to place their plants under their charge at its service for instruction, and when the institution makes wise use of the opportunities thus afforded, these plants become truly a part of its equipment, and the location then becomes a factor which must increase the efficiency of the instruction by an amount hardly to be overestimated. Such is the relation of the adjacent mines, mills and smelters of the college, giving students access to the vast equipment of many of the most successful mines in the world.

The location of a college in a district where its students live in a mining atmosphere, together with its special methods of instruction and the manner of using the mining environment have brought to the institution a large measure of success. It is a noteworthy fact that of the 328 men graduated to date, but 7 have left engineering for other pursuits.

Most of the students of the college have been from Michigan, as it is a Michigan institution, but it has trained men from all parts of the United States and from a number of foreign countries in both hemispheres.

During its twenty years of existence the Michigan College of Mines

has accomplished an incalculable amount of good in training and fitting young men for filling responsible positions requiring practical as well as technical knowledge. The practical knowledge is acquired in a measure, from personal observation and investigation of methods of operation used in some of the most vigorously worked and successful iron and copper mines on the globe.

The college is well organized with each branch of learning in charge of instructors eminently qualified by education and experience for training work of which the institution makes a specialty. At its head is Professor F. W. McNair, deeply learned and highly accomplished in the sciences taught, and possessing the rare faculty of being able to impart, in a clear, terse style, the knowledge and instruction that always proves helpful to the progress of students.

The board of control is made up of the following well-known gentlemen: James MacNaughton, General Manager Calumet & Hecla Mine, Calumet; Norman W. Haire, General Manager Osceola, Tamarack, Isle Royale and Ahmeek Mines, Houghton; Dr. L. L. Hubbard, General Manager Challenge, King Phillip and Winona Mines, Houghton; M. M. Duncan, General Manager Cleveland-Cliffs Iron Company, Ishpeming; William Kelly, General Manager Penn Iron Mining Company, Vulcan, and Hon. J. M. Longyear, Marquette, Michigan.

THE IRON INDUSTRY

THE IRON INDUSTRY.

The iron ore mining industry of the Upper Peninsula had another record year in 1906 and all former achievements were eclipsed in the number of mines operated, amount of ore produced, and the volume of business transacted. More men were employed and a larger amount of money was paid out in wages in a single year than any similar period in the history of the industry on the Peninsula. And except in a few instances in pioneer days when conditions were rough and rugged, higher wages were paid than ever before. The only drawback worth mentioning was the shortage of labor. There was not men enough of the right kind to go around and reliable help was in continuous demand at good wages all over the region. There was something for everybody to do who wanted work. This is a good, healthy, wholesome condition of affairs. A few narrow minded men may look upon high wages as a form of extortion, but broad, practical people realize that "good getters are good spenders," and everything which promotes the spending capacity of the people makes for industrial expansion and growth. The world's demand for iron ore and its allied products of late has exceeded the supply and the stock-piles had to be drawn upon to meet the demand. And this has occurred in spite of the fact that producers have been increasing the efficiency of plants and operating properties to the utmost of their capacity.

The consumption of finished and raw material, structural iron, sheets, iron bars and such metals as are used in building locomotives, ships, bridges and similar products is wholly unprecedented and without a parallel in the history of the State or of the Nation. And increased railroad traffic calls for heavier steel rails and in addition, there is a large amount of new railroad construction under way and contemplated.

Although the products of ore, and pig iron as well, made last year were the largest on record, yet stocks at the beginning of 1906 were smaller than at the beginning of 1905. This would indicate that the industries consuming iron products are expanding faster than the mines

But great as has been the activity of the industry in 1906, the new year seems to promise equal, if not larger returns. Representatives of the leading iron and steel concerns have expressed the belief that production in 1907 will exceed that of any previous year. The United States Steel Corporation, it is understood, now has on its books orders for 8,000,000 tons of material. This amount compares with 7,605,000 tons at the end of 1905; 4,696,200 tons for 1904; 3,215,100 tons for 1903 and 5,347,200 tons for 1902. A representative of the corporation says that 3,000,000 tons of additional business could be added if the capacity for production was sufficient

to allow deliveries in the first half of the coming year. A very large tonnage calling for delivery in the near future has been declined because of inability to produce the material.

Practically all of the steel companies are oversold for the first half of the year. With this condition existing, steel men do not think it unreasonable to expect that 1907 will be even a better year than 1906 has been.

In 1902, when 27,571,121 tons measured the outgo from the Lake Superior iron region, the production was heralded as a wonderful achievement, which it was, the nearest approach to the record having been 20,593,507 tons, registered the preceding season. The production dropped to 24,290,000 tons in 1903, and further fell to 21,820,000 tons in 1904. The following year saw all records smashed with a movement of 34,242,065 tons, this exclusive of 169,227 tons shipped from the Michipocten district of Canada and 111,391 tons from two small mines in southern Wisconsin. The output, thus compared with that of the banner year of 1902, showed a gain of 24 per cent for the three seasons intervening. Now, the record for 1905 has been surpassed by that of 1906 to the extent of 11½ per cent.

Comparative figures, showing the production, by ranges, follow:

	1905.	1906.
Mesaba	20,153,699	23,792,882
Menominee	4,495,451	5,109,088
Marquette	4,210,522	4,057,187
Gogebic	3,705,207	3,641,985
Vermillion	1,677,186	1,792,355
Miscellaneous		128,742
Total	34,242,065	38,522,239

To date, since the discovery of iron on the Marquette range, more than sixty years ago, there have been mined in and shipped from the Lake Superior fields the stupendous amount of 338,500,000 tons of ore. It was not until the season of 1901 that as much as 20,000,000 tons were produced while it required until the year 1895 to reach an output of 10,000,000 tons. In 1888 the shipments overcapped the 4,500,000 ton mark for the first time, just rounding it, and in 1884 they were only 2,518,693 tons; in fact, although the region has been producing for practically three score years, the mines have sent out approximately two-thirds of their product within the last decade. The relative importance of the various ranges may be noted from the following figures of output and date of opening of each district:

	Opened.	Tonnage.
Marquette	1884	80,471,888
Menominee	1877	58,538,206
Gogebic	1884	50,222,786
Vermillion	1884	25,490,256
Mesaba	1892	122,641,104
Total		337,563,344
All rail shipments, 1906, not yet classified by ranges		886,411
Total		338,449,755

With the products of the mines all practically sold, prices of ore are largely nominal, based as follows: Old Range Bessemer, $5; Mesaba Bessemer, $4.75; old range non-Bessemer, $4.20; Mesaba range non-Bessemer, $4. These prices show on their face advances of 75 cents on Bessemer and 50 cents on non-Bessemer. A factor of perhaps greater significance, however, is the lowering of basic guarantee of iron. On both old range and Mesaba Bessemer the natural iron content is reduced from 56.70 to 55 per cent and on both old range and Mesaba non-Bessemer reduction is from 52.80 per cent. Thus, if figured on the iron content heretofore maintained, and not on the reduced base, the actual advance has been practically 90 cents on Bessemer and 60 cents on non-Bessemer.

Comparative figures, based on the former iron content, follow:

Year	O.R.B.	M.B.	O.R.N.B.	M.N.B.
1900	$5.50	$4.50	$4.25	$4.00
1901	4.25	3.25	3.00	2.75
1902	4.25	3.25	3.25	2.75
1903	4.50	4.00	3.60	3.20
1904	3.25	3.00	2.75	2.50
1905	3.75	3.50	3.20	3.00
1906	4.25	4.00	3.70	3.50
1907	5.15	4.90	4.30	4.10

The total pig iron production of the United States in 1906 according to statistics issued by the American Iron and Steel Association was 25,307,191 tons as against 22,992,380 produced in 1905. Estimated value of 1906 product, $478,250,000.

The following shows a four-year's comparison of pig iron production in the United States:

1906.	1905.	1904.	1903.
25,307,191	22,992,380	16,497,033	18,009,252

The number of furnaces actually in blast in the second half of 1906 was 374, as compared with 361 in the first half. In 195 the number in blast during the last half of the year was 359, against 334 in the first half.

On December 31, 1906, there were 27 furnaces in course of erection and 5 furnaces were being rebuilt. In addition there were 23 furnaces projected and one furnace partly erected on Dec. 31.

THE WORLD'S IRON ORE RESERVES.

Professor Tornebohm estimates for the Swedish government the iron ore reserves of the world by countries, based on detailed figures for the individual districts, as follows:

	Tons.	Metallic Iron Per Cent.
United States	1,100,000,000	45 to 67
Great Britain	1,000,000,000	25 to 34
Germany	2,200,000,000	30 to 45
Spain	500,000,000	40 to 56
Russia and Finland	1,500,000,000	20 to 65
France	1,500,000,000	
Sweden	1,000,000,000	50 to 70
Austria Hungary and Other Countries	1,200,000,000	
Total	10,000,000,000	

Many will be surprised at the high figures given for the reserves in Great Britain and European countries. So much is heard of our own vast reserves and of the low grades of some of the foreign ores that we have come to think of the supply outside of North America as relatively small. The position of the United States is somewhat better than shown in the table when we take into account the grades of ore. By multiplying the figures by the average percentages of metallic iron given for each of the countries by Professor Tornebohm the result is as follows:

	Tons of Metallic Iron.
United States	603,166,600
Great Britain	295,000,000
Germany	825,000,000
Spain	249,375,000
Russia and Finland	637,500,000
Sweden	611,538,460

It is believed that the reserve for the United States, and hence the total, are higher than indicated in this table, but before taking up this question, we may consider conclusions that may be drawn from figures as they stand.

President Hadfield of the British Iron and Steel Institute has prepared a diagram showing the world's increase of pig-iron consumption since the fifteenth century and the production at this rate for the next century at the rate of the last 30 years. If the same rate of increase hold for the next century as has held for the last 30 years, in the year 2000, the world's

annual consumption of iron will be three and one-fourth times its present consumption. The total world's supply of iron ore now known, given as 10,000,000,000 tons by Tornebohm, will be exhausted in about 50 years. If the total be correct, about one-quarter of the world's known reserves have been used to the present time.

Prices for pig iron ruled about as follows:

Lake Superior charcoal	$19.25	to	$19.75
Northern foundry No. 1	19.00	to	19.50
Northern foundry No. 2	18.50	to	19.00
Northern foundry No. 3	18.00	to	18.50
Northern Scotch foundry	18.75	to	19.25
Ohio strong softeners No. 1			18.80
Ohio strong softeners No. 2			18.30
Southern foundry No. 1	18.40	to	18.90
Southern foundry No. 2	17.90	to	18.40
Southern foundry No. 3	17.40	to	17.90
Southern foundry No. 4	16.90	to	17.40
Southern No. 1 soft	18.40	to	18.90
Southern No. 2 soft	17.90	to	18.40
Southern gray forge	16.15	to	16.65
Southern mottled	15.90	to	16.40
Southern silveries (4 to 6 per cent silicon)	17.90	to	18.40
Jackson Company silveries (8 to 10 per cent silicon)			23.30
Alabama and Georgia car wheel	24.40	to	24.90
Malleable Bessemer	18.50	to	18.80
Standard Bessemer			19.30
Basic Iron			18.85

Lake Superior Iron Ore shipments for the past sixteen years:

1891	7,071,053
1892	9,072,554
1893	6,934,828
1894	7,748,312
1895	10,429,037
1896	9,934,828
1897	12,464,574
1898	14,024,673
1899	18,251,804
1900	19,059,393
1901	20,593,507
1902	27,571,121
1903	24,289,878
1904	21,822,839
1905	34,242,065
1906	38,522,239

THE OLIVER IRON MINING COMPANY.

Is the iron ore producing branch of the United States Steel corporation—the largest and most comprehensive producer of finished and raw materials on the globe? There are very few concerns in the world that employ one-half or three-quarters as many people as does the United States Steel Corporation. During the calender year 1906, the steel trust, so called, employed 202,457 persons, and its pay roll of salaries and wages amounted to the large total of $147,765,540. In its manufacturing properties there were employed 147,048 persons; coal and coke, 21,929; iron ore mining, 14,393; transportation, 16,638, and miscellaneous properties, 2,449. Compared with 1905, there is shown an increase of 12,299 persons, and $19,712,585 in salaries and wages. On January 1 and March 1, 1907, an increase averaging 6.6 per cent, or about $6,000,000 per annum, was made in the wages and salaries of approximately 131,000 employes, or 65 per cent of the total employes of all companies. The average rate of pay received by all employes are the highest for any time since the formation of the trust.

The mines owned, controlled and operated by the corporation are distributed all over the iron region of the Lake Superior district and have an annual capacity of 20,000,000 tons of ore. Ores produced are among the most desirable and valuable varieties for general purposes are in demand always at the highest market prices. The corporation also operates upwards of 60 coking plants; a lake fleet of more than a hundred vessels, some of which are as large as ocean greyhounds.

During 1906 ore shipments on the vessels of the United States Steel Corporation amounted to 11,355,000 tons or a little more than 50 per cent of the total business of the corporation, and it is but reasonable to expect the corporation to increase tonnage materially, as it is now doing. It will be able to move at least 2,000,000 more in its own bottoms during 1907, and if the season starts in fairly early will do better than this.

The corporation also operates water supply plants; a hard ore crushing and conveying plant at Escanaba; extensive ore docks at different lake points besides various other works. The mines operated employ more men, square a larger monthly pay roll and produce a larger output of ore than any other single interest in this or any other country. Mineral, timber and other lands owned by the companies are located in different ranges of the district and contain immense bodies of ore of both hard and soft varieties. The reserve ore bodies opened up in the mines and available for production, at the present rate of mining, are sufficient to last for many years to come. And it is well that this is so. To meet existing demands for ore, every mine of the district must be worked to its full capacity and the resources of the region drawn upon more heavily than ever before. And this also is well for it means a continuation of the present era of prosperity for an indefinite period. The vast proportions which the company's operations may reach within the next ten years must be judged by the results accomplished in the past.

Because of its erratic record iron has been aptly termed "a prince or a pauper" but so far as economists are able to penetrate the future, there are no signs of warning on the business horizon indicating that the phenomenal demand for iron products is likely to fall off in the immediate future or that the limit in the volume of business transactions has yet been reached.

Mr. Thomas F. Cole is president of the Oliver Iron Mining company and resides at Duluth, Minn.; Mr. Pentecost Mitchell is manager with Mr. John McLean assistant manager.

In every department connected with the company's mines, order and system prevail in a high degree and the affairs of the corporation are transacted with exacting knowledge and marked ability. The policy outlined and followed by the management has been broad and liberal; fair and considerate and the cohesion of prices maintained for the products of the district has worked with distinct success and for the general good of all companies alike and workmen as well. Men are paid good wages and have been given the opportunity to invest their savings profitably through the purchase of the preferred stock of the U. S. Steel Corporation at a price materially below the market quotation and pay for it in easy monthly installments. On such stock an annual bonus of 5 per cent in addition to the regular dividend is paid for a period of five years to such employes as remain in the company's service. The men are generally contented, and there is employment for all who wish to work. The policy of the sharing profits with employes was first adopted some years ago, and has been extended gradually as its favorable features have been recognized. It scarcely needs argument that the relation between the employer and employee are made more cordial and permanent if the latter feels that he has a direct interest in making the business as large and as profitable as possible. That the idea is met with favor is evident by the alacrity with which the employees have availed themselves of the privilege. Last year 12,256 employees subscribed for $2,400,000 worth of its preferred stock at par.

The mines are in the hands of experts who know the business thoroughly and do it right. They are opened up and developed on practical modern methods for the general results and equipped with permanent machinery plants designed for the work; are ably and efficiently managed and progress has been substantial and continuous.

The following mines located in the Marquette range, are controlled by the company: The Lake Superior group comprising the Hard Ore, Hematite, Sec. 16 and Sec. 21; the Winthrop; Regent group, comprising the Queen, Prince of Wales and Blue; Champion; Moore; Richards. General Superintendent, William H. Johnston; Superintendent, F. E. Keese; Assistant to General Superintendent, D. J. Sliney; Chief Clerk, J. C. W. Chipman; Mining Engineer, Andre Formis; Assistant Mining Engineer, H. T. Hulst.

LAKE SUPERIOR IRON COMPANY

This is one of the most substantial and best known corporations in the iron ore region, having been organized on the 13th day of March, 1853—just 54 years before this paper was written.

From the beginning of operations, big sums of money have been spent in sinking shafts and in developing the mines underground and on surface. It has been a substantial producer, an excellent business enterprise and one of the chief supports of the town of Ishpeming. It is credited with having produced a total output of 13,886,962 tons of ore. 1,025 men are employed and 750,000 feet of B. M. lumber and heavy timber, besides 1,200,000 lineal feet of lagging and cribbing material are used annually for mine work. Ore shipments made during 1906 amounted to 742,427 tons as against 755,392 tons sent out the previous year. Hard Ore, Hematite, Section 16 and Section 21 mines are owned by the Lake Superior Iron Company.

HARD ORE MINE

Lake Superior Hard Ore is located in the north half and the south-east quarter of Section 9 and the north half of the south-west quarter Section 10, Town 47, Range 27, just south of the town of Ishpeming on a line of the C. & N. W. Railway. Ishpeming is a pretty town with about 12,000 inhabitants. Hard Ore mine is opened and developed through three working shafts. Dimensions: No. 6 shaft, 8x10 feet and 840 feet deep; No. 2 shaft, 7x9 feet and 720 feet deep; No. 7 shaft, 15½x6¼ feet and 920 feet deep. Skips operate singly and lift 2.5 tons of ore to a trip. All told, 19 levels are extended from shafts and the product of ore is recovered from the 7th, 8th, 9th, 10th, 15th, 17th, and 19th levels. 250 men are employed. Shafts generally are sunk in the footwall side of ore bodies and the product recovered through a series of crosscuts driven from the shaft stations or levels. Operated in that manner, shafts are hardly ever disturbed and last as long as the mine. And when any particular place has been exhausted of ore, the walls may come together and fill up the openings or stand up, so far as the management is concerned, as they can in no way interfere with future work. Underground openings are developed on practical lines and operated on modern methods of mining. Shafts are connected at different levels, which ventilate the workings and keep them airy, cool and comparatively comfortable for doing all underground work. Levels in turn are connected by raises or winzes making a complete network of openings. No reasonable amount of labor or expenditures are spared in making every department comparatively safe. Future requirements are anticipated and provided for well in advance. The ore body mined is substantial and continuous and so far as appearances go, good for years ahead at the present rate of production. The stoping method is used for taking out the product. Skips counter-

balance in shafts and dump automatically. The work is readily and economically performed. Compressed air for operating machine drills, etc., is supplied from Section 16 mine.

Mechanical equipment is modern, highly efficient and generally adequate for requirements. Machinery buildings are substantial and well located. Equipment includes one 24x48 inch simple duplex Brown hoisting engine, geared motion, operating 4x12-foot drums 6-foot face grooved for 1¼-inch rope, built by Webster, Camp & Lane. Hoists from No. 2 Hematite shaft skip and Hard Ore No. 6 shaft and Hard Ore No. 7 shaft, one 22x36-inch reversible simple slide valve Hoisting Engine geared to two eight-foot drums, 4-foot face grooved for 1¼-inch rope. Engine built by Iron Bay Mfg. Co., drums by Webster, Camp & Lane, hoists from Hard Ore, No. 2 shaft and No. 2 Hematite Cage. One 72-inch by 18-foot return tubular boiler. Three 72-inch by 15 foot return tubular boilers. A complete main and auxiliary pumping plant underground. The plant is practically complete, in good running order and economically operated.

Superintendent, F. E. Keese; assistant superintendent, D. J. Sliney; mining captain, John McEncroe; chief clerk, J. C. W. Chipman; engineer, A. Formis; assistant engineer, H. T. Hulst. Postoffice address, Ishpeming, Mich.

HEMATITE MINE.

This mine is located directly south of Ishpeming, in the northeast half of the southwest quarter, Section 10, town 47, range 27, and consists of 80 acres of land. The mine is opened and operated through two working shafts 570 feet deep and 190 feet deep respectively. Shafts are substantially constructed and capable of taking out a large product of ore. No. 2 shaft is 7x14 feet in dimensions. No. 3 is 5x8 feet. Two compartments are used for hoisting ore, etc., the third for ladder-way and pumping outfit. Men are lowered in and lifted out the mine workings with cage operated with Hard Ore hoist. About 280 men are employed and compressed air for operating machine drills is supplied from Section 16 compressor. There is considerable development work going ahead on this property and three levels are being extended from shaft to ore body. Work is conducted vigorously and in up-to-date methods. Ore body is substantial and contains some fine blocks of ground opened up in systematic order. Underground openings are connected in various places and air circulates freely through them. This is a comfortable mine and men like to work in it. The product is taken out by means of the "caving system" which answers admirably for the ore deposit mined. The product is taken from the 570-foot and 190-foot levels and developing work and opening up fresh reserves of ore is conducted on the 190-foot level of the No. 3 shaft.

Management aims to get out the best there is in the property and progress has been substantial. The ore mined runs about 62.50 per cent iron and less. Bessemer and Non-Bessemer comes out. Mine is in a

prosperous condition and looks well. Its future outlook is very promising.

For amount of timber consumed annually and the product of ore, see Lake Superior Iron Company. The product of this mine is lifted with Hard Ore Hoists. Its equipment includes well equipped workshops, substantial mine buildings, well situated for the best results, besides a complete main and auxiliary pumping outfit and supplementary additions adequate for requirements.

Mining Captain, Samuel Jewell.

SECTION 16 MINE.

Lake Superior Section 16 adjoins Pittsburg & Lake Angeline on the east and lies in the Southeast quarter of the Southeast quarter of Section 9, Northeast quarter of the Northeast quarter Section 16, in Town 47, Range 27, and consists of 80 acres of land. Mine location is just south of Ishpeming. The amount of timber used and the product recovered are included in the Lake Superior Iron Company's statement. 270 men are employed on this property and a 50-drill capacity air compressor is operated. Mine is opened up and developed through one exceptionally fine working shaft, 7x16 feet in dimensions, three compartment and 955 feet deep. Besides there are two rock-filling shafts one with good ladderway for second outlet. Ore product is recovered from 680, 830 and 955-foot levels. Fourteen levels are extended from shaft and development work is underway at the bottom level, 955 feet below the surface. Underground openings are in good shape and the physical condition of the mine is first-rate. Ore body is opened up well ahead and apparently good for years to come. Drifts are going forward and the usual amount of ground is being opened up in accordance with the policy of the management. Ore produced is Hematite and Hard-Bessemer and Non-Bessemer. It runs 51.50 per cent and less. Openings contain some fine stopes of ore that look well. Underground openings are connected at various points and well ventilated. The "stoping method" is used for taking out the product and it seems just the thing for the ore deposit mined. Men are distributed to the best advantage for general results. No money or effort is spared to make the mine safe and comfortable and every department seems to be running to perfection. Opening work is conducted with a view to getting the best results and progress has been substantial. Compressed air for Hard Ore and Hematite are supplied from Compressor located on this property. The product is trammed by hand labor, skips counter-balance in shafts and dump automatically. The product is readily and economically produced. Mechanical equipment is of the best, powerful, practical, highly efficient and economical. Machinery buildings are substantial and arranged for the best service. Equipment includes one 24-inch by 48-inch single Corliss Hoisting Engine geared to one drum 10 feet in diameter, 8' 9" face, grooved for 1⅜-inch rope. Engine built by E. P. Allis Company. Drums built by Webster, Camp & Lane. Hoist in balance. One Duplex Com-

pressor, 26x42" cross compound Corliss Engine 25½" and 42x48" cross compound Corliss 25½" and 40x48" two stage cylinders. Engine built by the Rand Drill Company. Air cylinders Nordberg Manufacturing Co., furnishes air for Section 16, Hard Ore and Hematite mines. Average number of drills operated, 80. Four 72" by 15' return tubular boilers furnish power for operating the machinery. A complete main and auxiliary pumping plant underground and supplementary additions and fitting adequate for requirements complete the equipment.

Mining captain, William Trebilcock.

SECTION 21 MINE.

This mine is situated three miles from the town of Ishpeming in the South half of Northwest quarter and Southwest quarter of Northeast quarter Section 21, in Town 47, Range 27 and consists of 120 acres of land. This mine produces a soft Hematite and employs 225 men on an average. Operations are conducted through two working shafts, 760 and 700 feet deep respectively. Each has three compartments. One is 7x18' in dimensions, the other 7x12'. These are fine shafts, in first-class running order and capable of taking out a large product without crowding. Underground workings are being developed on broad, practical lines and in the right way for bringing the best results. The 700' and 740' levels are going forward from shafts developing fresh reserves ahead so that men may be distributed throughout the workings to the best advantage. The product is recovered from the 700 and 760 east levels and the 580 and 640 west levels. The ore body mined is substantial and holds down with no part looking better or promising more for the future of the property than the deepest openings penetrated. It has a bright future outlook. Underground openings are connected in many places and air circulates freely through the mine. The product is recovered through the caving system and it answers admirably, consuming but little timber in conducting the work. Surface equipment is modern, efficient, designed for the work and economical. Power houses and workshops are arranged with a view to bring the best results. Shops are fitted with modern tools for doing mine work and the machinery is in first class condition and running smoothly.

Equipment includes: One 22x42" simple Corliss Engine geared to two drums 8' diameter 4' face, grooved for 1¼" rope, built by Bullock Manufacturing Co.; one 22x42" reversible Corliss engine geared to two drums 8' diameter 4' face, grooved for 1¼" rope, built by Bullock Manufacturing Co.; one Duplex compressor 16x30", simple duplex slide valve engine 16½x30" single stage air cylinder, built by Rand Drill Co., one 60" by 15' return tubular boiler. Three 72" by 15' return tubular boilers furnish power for running the machinery. Complete main and auxiliary pumping plants underground. The product from the property is included in that of the Lake Superior Iron Company.

Mining captain, John Trebilcock.

REGENT GROUP OF MINES.

The property of the Regent Iron Company commonly known as the "Blue" and sometimes as the "Queen" group and consists of about 64 acres of land in the Southwest quarter of Southwest quarter of Section 5, Town 47, Range 26, Marquette County, and is situated southeast of the town of Negaunee. The average number of men employed was 360 and the mine produced 310,596 tons of ore as against 262,011 tons shipped the previous year. This product includes the Prince of Wales. Ore body as regards size and quality is fair and medium and promises to turn out first rate. Ore mined is a soft Hematite and runs about 60 per cent iron and less Non-Bessemer. The mine is operated and developed through one fine shaft 6x15′ in dimensions, 3-compartment and 740 feet deep. Skips are operated in balance and lift 5 tons to a trip. Ore is dumped automatically and trammed to stockpile. Two levels, the 740 and 895, are extended from shaft. The product is taken from the 650′ and 740′ levels. The property is credited with producing previously to 1906, 2,323,764. Outlook for the property is good. Underground department is in fine physical condition and looks well. A 25-drill capacity Rand Compressor furnishes power for drills and all tram-cars are operated by electricity. Three 30-horsepower 24″ guage Electric Mine Locomotives are used for the work. Method in vogue for taking out the product is "caving system" and it answers admirably. The amount of timber used in the mine work annually is 358,000 feet, B. M. Stull timber, and 480,000 lineal feet of lagging and cribbing. Mine ventilation is good connecting with the Prince of Wales shaft by new raise for ventilation and additional outlet to surface.

Equipment embraces one E. P. Allis Duplex 16″x36″ engine, operating one drum 7′6″ diameter, 7′7″ face, grooved for 1¼-inch rope. One Duplex Compressor, 18x30x30″ Cross Compound Condensing Simple Slide Valve Engine, 18x30″ air. Four 72″x30″ Return Tubular Boilers. Complete main and auxiliary pumping plants underground.

The whole plant is of the best, in first class condition and everything in and about the mine runs smoothly and is doing full duty.

Improvements completed during 1906 include one 100 K. W., 250 volts direct current, compound wound Westinghouse generator, operated by one 14″x30″ R. H. Horizontal single cylinder, non-condensing Corliss engine. Installation of complete electric haulage system on the 740′ level. Installation of one 72″x18′ return tubular boiler.

Improvements contemplated include the erection of modern change house equipped with metal lockers, shower baths, etc., besides the installation of new hoisting plant.

The figures given on production previous to 1906 cover only the times that the mines have been under lease to the Regent Iron Company and operated by the Oliver Iron Mining Company.

Richard Roberts, mining captain.

PRINCE OF WALES — (REGENT MINING COMPANY.)

This is a developing proposition and sinking one fine shaft, three-compartment, the shaft being 6'x15' in dimensions, to take out a product on the 600-foot level. The shaft is now sinking below the 440-foot level. For product, see Blue or Queen Group of Mines.

About 15 men were employed during 1906 and the prospects for the property are bright. Property is well managed.

Improvements contemplated consist of erection of Steel Head Frame, Engine and Boiler House, Change House, Shops and Coal and Ore Trestles, installation of a new pumping plant underground and installation of new boiler plant, hoisting machinery, etc.

Mining captain, Richard Roberts. Postoffice address, Negaunee, Michigan.

HARTFORD MINE.

The Hartford is situated about one-half mile northwest of the town of Negaunee in East half of Lot 5, Lots 6 and 7, Section 36, Town 48, Range 27, making about 65 acres of land. Mine location is conveniently located and contributes material support to Negaunee. Its ore deposits are substantial, consisting of soft Hematite running about 6 per cent iron and less. Both Bessemer and Non-Bessemer ore are produced. In 1906 the mine produced 349,871 tons ore as compared with 336,856 tons shipped the previous year. Mine is opened and operated through two shafts, No. 1 and No. 2. No. 1 is 8x10' in dimensions and 650' deep. No. 2 is 5x15' in dimensions and 975 feet deep. Underground openings are developed on up-to-date methods. Future requirements are anticipated and planned well in advance of actual necessities. Ore bodies are opened up and blocked out in the best way for bringing the best results and form some fine stopes of ground. Levels are connected at various points and producing places well ventilated. The mine is well managed and seems to be in a prosperous condition. Product comes from 750 and 825-foot levels and both are being extended in the process of developing fresh reserves. The "caving" system is used for taking out the product and about 100,000 feet B. M., lumber and heavy timber as well as 128 M. lineal feet of lagging are used annually in the mine work. Every effort is made to keep the mine in a safe condition and comfortable for working in. About 300 men are employed on an average and a 25-drill capacity air compressor operated. Operations are conducted economically and order prevails everywhere. Mechanical equipment is in good running order, well adapted for the work and adequate for requirements. Skips counter-balance in shaft and dump automatically.

Equipment embraces: One pair 24x48" reversible duplex first motion Corliss hoisting engines operating one 9-foot drum, face 130 inches, grooved for 1⅜" rope. Built by Bullock Mfg. Co.; one Duplex compres-

sor 16x30x36", Cross compound Corliss engine 17½x28x36", two-stage air cylinders. Built by Rand Drill Co.; four 72" by 18' return tubular boilers furnish steam for operating machinery. Complete main and auxiliary pumping plants underground.

Additions and improvements completed during 1906, and also underway, include one 18x18" single cylinder geared Corliss Hoisting Engine operating two cylindrical drums, 8' diameter, 6" face, grooved for 1⅛" rope. Ratio of gears 3 to 1. Engine built by E. P. Allis & Co., Drums by Webster, Camp & Lane. Used for handling men and timber in No. 1 shaft. Installation of Electric Lighting and Underground Haulage System. Equipment: One 100 K. W. 270 volts, 345 Amp. Westinghouse Generator, operated by one 14x16" L. H. Horizontal Single Cylinder side crank Ball engine with self contained frame. Three 30-horsepower 24" guage Electric Mine Locomotives. Erection of new Blacksmith and Carpenter Shop, 28x60'. Remodelling Change House including installation of Metal Lockers, Wash Troughs and Shower Baths.

Mining captain, Elijah Toms. Postoffice address, Negaunee, Mich.

CHAMPION MINE.

Champion is among the oldest iron mines on the Marquette Range, having been in operation off and on since 1868. It has been a substantial business enterprise, well managed from the start, vigorously operated and since the commencement of operations produced a total output of 4,377,470 tons of ore. 42,099 tons of ore were shipped during 1906. From July to December, 100 men were employed. Champion ores are of the Bessemer grade, magnetic and specular varieties. Mine territory is large and contains considerable bodies of ore blocked out that may be turned to profitable account before long, as a brisk demand for practically all classes of ore seems likely to continue for some time to come. Mine is opened with two shafts, No. 5 and No. 7. Number 5 is 8x10' and 1,960 feet deep. Number 7 is 7x16' and 1,810 feet deep. The property is extensively opened up with deep shafts and long levels in good repair and connected at many points making free circulation of air. Champion has fine equipment. Buildings are substantial and conveniently located for service required. Machinery is of the best, powerful and adequate for requirements. Machinery has been overhauled and put in thorough working condition. Skips operate singly and lift four tons to a trip. Development work underway includes drifting on the 32nd level, No. 5 shaft, and sinking No. 7 shaft below the 30th level. Product is being taken from below the 18th to 30th levels. Tramcars are operated by hand labor and the method in vogue for taking out the product is "stoping." From July to December 31, 12,580 feet, B. M., Stull timber and 258 lineal feet lagging and cribbing.

Equipment includes a 50-drill capacity Nordberg Compressor, one 28x60" Reversible Corliss Hoisting Engine, operating two cylindrical drums 14' diameter, 7' face, grooved for 1¼" rope, built by E. P. Allis & Company,

Milwaukee, Wis. One 10x30" Simple Corliss Engine, operating one 55 K. W. General Electric Dynamo, for lighting purposes, one Duplex Compressor, 30x46x48" Cross Compound Corliss Engine, 28x44x48" two-stage air cylinders. Four 72"x16' return tubular boilers. Complete main and auxiliary pumping plants underground.

Mining captain, Charles Champion. Postoffice address, Beacon, Michigan.

THE CLEVELAND-CLIFFS IRON MINING COMPANY.

The company occupies a prominent position among the progressive and successful iron ore organizations operating in the Lake Superior district and it has a good record. It is composed of people who know the business thoroughly and do it right. Every move made counts and general progress has been continuous and of the nature that means improvement and a stretching out for bigger and better results. The present capacity is about 2,000,000 tons of ore in Michigan with ample deposits and scope for further expansion and a heavier production. During 1906, the company shipped from its Michigan mines 1,997,197 tons of ore and but 2,803 tons from the two-million-ton mark.

Under titles somewhat modified, the organization has been in aggressive and successful operation for upwards of fifty years and so far as the physical appearance of its properties is concerned, there is no evidence in view to indicate why the company may not continue aggressively mining ore for many years to come.

The Cleveland-Cliffs company forms one of the largest and most important iron ore producing organizations in the state, with works scattered and varied and its record for up-to-date progressive mining and busines methods stand among the highest in the land.

The company has spent vast sums of money in the purchase of iron lands; in opening up and developing into mines the ore bodies contained in them and in equipping the properties with powerful machinery plants of modern build for conducting the business of mining on a large scale and on economical lines. The mines are ably and vigorously operated and for the best interest of the company. Order and system is kept well in the foreground and the business affairs of the mines are transacted with precision and exactness. The ore bodies developed and available for production are sufficient to last for years at the present rate of production and the physical condition of the mines was never better than at the present time, nor did the future outlook for them ever look better.

A noteworthy feature and emphatically a praiseworthy one maintained by the managers of the iron and copper mines alike, in the Lake Superior district, is the special care and attention paid to the general comforts and home life of the company's employes and their families. In most cases employes are provided with comfortable dwellings having nice patches of ground; the advantages of a mine physician; good water for

domestic use; fuel at practically cost to companies, and many other advantages and in some instances, electric light and sewerage system. And it really pays, for if good men are to be kept, they must be provided with such conveniences or they will go to other parts where they may be had. In this particular, the Cleveland-Cliffs Company affords a splendid example, for the management has gone so far as to pay a special premium for the best cultivated gardens and the most attractive residences. The movemen has worked very successfully indeed. The result is that many employes now have cultivated pretty gardens; raise their own vegetables and small fruits, besides adding quite notably to the attractiveness of their residences and to the general appearance of the location. Other companies might do likewise, for it would be a move in a worthy cause and result in bringing about inestimable good and all would be benefited.

The demand for iron ore during 1906 was continuous and the Cleveland-Cliffs Company, with others, had a very prosperous year while the business for 1907 promises to tax the district to its utmost capacity. Officers of the company are: President, W. G. Mather; vice-president, J. H. Wade; auditor, R. C. Mann; secretary, J. H. Sheadle; treasurer, W. G. Mather; main office, Cleveland, Ohio; mine office, Ishpeming, Mich.; mine agent M. M. Duncan; mine auditor, A. J. Yungbluth; mining captain, J. H. Rowe; engineer, J. E. Jopling.

Cleveland-Cliffs Company operates the following mines, located on Marquette and Gogebic ranges: Lakes, Cliffs, Negaunee, Princeton, Austin, Salisbury, Moro, Maas, Stephenson, Lucy, Smith, Ogden, Imperial and Jackson.

LAKE SHAFT MINE.

This is a remarkable mine with a fine record and has produced since the beginning of operations millions of tons of ore. Its ores were discovered with the diamond drill years ago and it has formed, and still forms one of the solid business enterprises of the region. The mine is located within the corporate limits of Ishpeming and lies under the bottom of old Lake Angeline in Section 10, Town 47, Range 27.

The ore produced is a soft Hematite inclosed between walls of diorite running nearly due east and west. Ore analysis:

Iron: Lake Bessemer, 63.00; Phos., .040; Iron: Lake, 60.00; Lake Bessemer Iron: Silica, 48.0; Phos. .043.

The caving system is used for taking out the product and it works admirably. Mine is opened and operated by means one of the finest shafts in the district, 470 ft. deep, 10x16 feet in dimensions and four-compartment. Mine employs on an average 440 men and operates 15 machine drills. 1906 ore shipments amounted to 567,904 tons as compared with 551,304 tons shipped the previous year. The mine is opened up on broad, practical lines and operated on up-to-date methods. Liberal allowances have been made for betterment work from time to time and every department of the

mine is in first-class form and running satisfactorily. Daily capacity of the mine is about 2,000 tons of ore. In 1906, almost a million feet of timber, board measure, was used underground for holding up and supporting the works. Workings are in good condition, and, as the mine goes, comfortable and safe. All tramming is done by an electric haulage system. Trams dump directly into skips, which are hoisted to surface and in turn dump in ore cars and the load transferred to the stockpile. The work is readily and economically done. Operations are conducted on practical lines and the management aims to get out the best there is in the property and in the most business-like way. Results accomplished have been fairly substantial and should be, in the main, satisfactory. Mechanical equipment is of the best, in good running order and includes hoisting plants, a 45-drill capacity air compressor plant, pumping outfit, workshops conveniently located and supplementary appliances adequate for requirements.

Alfred Collick, mining captain; T. H. Bargh, chief clerk; J. R. Reigarh, mining engineer.

CLIFF SHAFT.

This property lies just west of Ishpeming in Section 9, Town 47, Range 27, and forms a notable mine. It has a good record and stands well in the estimation of the people. It is in the best condition and economically operated. Operations are conducted through two shafts, 10x14 feet inside measurement. Each has two compartments operating cages. Shafts are 692 and 696 feet deep respectively, substantially constructed and in good working condition. 314 men are employed, 35 power drills operated and during the season of 1906, ore shipments amounted to 269,845 tons as against 230,915 tons shipped the previous year. The ore mined is Red Specular. Lump, 53.40 per cent iron and Crushed 62.60 per cent iron. Two cages operating in balance are lifted at once, each carrying two tons of ore, making four tons of ore hoisted to a trip. Speed, 800 feet per minute. Shafts were sunk deeper, levels extended further and fresh reserves of ground were developed during 1906. Shafts are connected and air circulates freely through the workings. The method used for taking out the product is "breast, back and underhand stoping," and it works first-rate for the deposit of ore mined. Underground department is in fine condition and looks well. Operations are practical and up-to-date. Work is dispatched in the best way for bringing the most satisfactory results.

Tramming is done by hand labor. Trams dump directly into skips, which are hoisted to surface and in turn dump in ore cars and the load transferred to the stockpile. The work is readily and economically done. Mechanical equipment is in good running order and includes hoisting plants, a 50-drill Nordberg air compressor plant, pumping outfit, workshops conveniently located and supplementary appliances adequate for require-

ments. New additions added during 1906 embrace a Sullivan "Second Motion" hoist, which hoists two cages at one time, speed 800 feet per minute, load 12 tons.

W. W. Groff, superintendent; J. R. Reigarh, engineer; J. F. Van Brocktin, clerk; James Stephenson, mining captain.

NEGAUNEE MINE.

This mine is situated just east of the town of Negaunee in Section 5, Town 48, Range 26, and has been an important producer for many years and is credited with having produced since the beginning of operations a total well on towards 3,900,000 tons of ore. The average number of men employed during 1906 was 338 and the number of power drills operated was 14. The amount of ore shipped was 249,403 tons as compared with 242,617 tons sent out in 1905. The ore body mined is a Soft Hematite running 60 per cent Iron and .060 per cent Phosphorus.

The mine is operated through two fine shafts: One is 8 feet by 8 feet and double compartment, the other 8 feet by 16 feet, with three compartment and 750 feet deep. Amount of ore hoisted in skips to a trip is three tons. Skips are operated in balance and dump automatically. The daily capacity of the mine is about 950 tons of ore. In 1906, shafts were sunk deeper, levels extended further into new ground and fresh reserves of ore were opened up and put in condition for economical extraction. The "caving" system is used for taking out the product and it works well. No reasonable expense is spared to make the mine safe and comfortable for working in. In 1906 over 500,000 feet of timber, board measure, was used for supporting and holding up ground. Underground tramming is done by an "electric haulage" system, which renders first class service and is highly appreciated by the trammers. It is a big improvement over the old method of pushing cars. Surface equipment is ample for requirements and embrace "geared hoists" with two skips in No. 2 shaft, cage in No. 1, 12-drill capacity compressor and the usual mine buildings and appliances that go to complete a well-appointed mining plant.

Superintendent, S. R. Elliott; mining captain, G. A. Anderson; engineer, J. R. Reigarh; chief clerk, O. W. Peterson.

PRINCETON MINE.

This mine is located at Princeton and adjoins the Austin mine on the north. It is an interesting mine, has solid merit and is developed into a substantial producer. It is opened up on practical lines and in the best way for bringing the most satisfactory results. Progress has been continuous and of the right kind.

During 1906 the average number of men employed was 265 and the output of ore was 178,524 tons as against 59,667 tons reported for the previous year. The ore produced is a Soft Hematite running 59.26 per cent

iron. Ten power drills are operated and the method in use for taking out the product is "caving and square sets." Mine is opened and worked through two fine shafts, substantially constructed, in fine condition and good for a large output. Shafts are three-compartment, 8x16 feet in dimensions. No. 1 is 298 feet deep, and No. 2 is 400 feet deep. Ventilation is very good. Daily capacity is about 650 tons of ore. Development work is kept going always and substantial progress has been made. Management is efficient and up-to-date.

All tramming is done by hand labor. Trams dump directly into skips which are hoisted to surface and in turn dumped in ore cars and the load transferred to the stockpile. The work is readily and economically done. Operations are conducted on practical lines and the management aims to get out the best there is in the property and in the most business-like way. Mechanical equipment is in good running order, and includes hoisting plants, a Sullivan straight line 10-drill capacity air compressor plant, pumping outfit, workshops conveniently located and supplementary appliances adequate for requirements.

Superintendent, G. R. Jackson; mining captain, William Jory; engineer, B. A. Middlemiss; chief clerk, Geo. A. Sarasin.

AUSTIN MINE.

This is practically a young property forging right ahead and building up a creditable record. It is located at Princeton and adjoins the Princeton mine. Ore shipments in 1906 amounted to 166,145 tons as compared with 61,813 tons shipped the previous season. The mine employs on an average 176 men and operates six machine drills. Ore body mined is a Soft Hematite running 64.70 per cent iron and .060 per cent Phosphorus. Mine is opened through one shaft, 10′ 8″x11′4″ in dimensions and 338 feet deep. Skips operate singly and carry two tons of ore to a trip, and the method used for taking out the product is "caving" and it answers first rate for the work. No ordinary expense is spared to make the underground department safe and comfortable for working in and well on to 350,000 feet of timber, board measure, are consumed annually for keeping the works in first class condition. The mine is in a prosperous condition and good things are predicted for it. Tramming is done by hand labor. Trams dump directly into skips which are hoisted to surface and in turn dumped in ore cars and the load transferred to the stockpile. The work is readily and economically done. Operations are conducted on practical lines and the management aims to get out the best there is in the property and in the most business-like way. Results accomplished have been fairly substantial and should be, in the main, satisfactory. Mechanical equipment is in good running order and includes hoisting plants, an air compressor plant, pumping outfit, work-

shops conveniently located and supplementary appliances adequate for requirements. Superintendent, G. R. Jackson; mining captain, J. Ellis; engineer, B. A. Middlemiss; chief clerk, Arthur Uren.

MORO MINE.

This mine lies in Section 10, Town 47, Range 27, and is situated just east of Ishpeming and is quite a uniform, substantial producer. It is developed through one large shaft 10x15 feet outside measurements, two compartment, and 814 feet deep. Its product of ore in 1905 was 74,932 tons. There are 101 men employed and 12 power drills operated. Ore produced is Red Specular. Analysis: Scotch, 61.70 per cent iron. Ore bodies are large and apparently good for a considerable time ahead. The product is recovered on the "breast, back and underhand stoping" systems. Underground operations are conducted through one shaft, 10x15 feet in dimensions and 812 feet deep. The mine is developed on practical lines and its physical condition is first-rate. The amount of ore hoisted to a trip is 1¾ tons and skips operate singly. The property is ably and skilfully managed and for the best interest of the company, and its future well being. Tramming is done by hand labor. Trams dump directly into skips which are hoisted to surface and in turn dump in ore cars and the load transferred to the stockpile. The work is readily and economically done. Operations are conducted on practical lines and the management aims to get out the best there is in the property and in the most business-like way. Mechanical equipment is in good running order, and includes hoisting plants, a Nordberg 50-drill capacity air compressor plant, pumping outfit, workshops conveniently located and supplementary appliances adequate for requirements.

Superintendent, W. W. Graff; mining captain, Duncan Campbell; engineer, J. R. Riegarh; chief clerk, James Murphy.

SALISBURY MINE.

This mine is located about a mile and a half south of Ishpeming in Section 15, Town 47, Range 27, and forms one of the best known iron properties in the Marquette range. It has been profitably operated for many years and forms a fine business enterprise. It is worked on up-to-date methods and every department is running satisfactorily. The average number of men employed during 1906 was 180 and four machine drills are operated. Ore body mined is a Soft Hematite and in 1906, the amount of ore shipped was 147,417 tons as compared with 149,664 tons shipped out the previous year. Analysis: Salisbury, 60.50 per cent iron; Clinton, 63.00 per cent iron. Product is recovered through one shaft, 7x20 feet inside measurements and 1,040 feet deep. Skips operate singly and dump automatically in cars, which carry two tons to a trip.

The property is opened up and mined on the most practical way for bringing the best results. Progress has been continuous, substantial and of the right kind. Underground workings are in fine condition and no reasonable expense is spared in making them comparatively safe for men to work in. For holding up the ground and other mining purposes, about 325,000 feet of timber, board measure, are consumed annually in the mine work. Mine contains some fine stopes of ore and look first-rate. The daily capacity of the mine is about 550 tons. Tram-cars are operated by hand labor and the method in vogue for taking out the product is the "caving" system. Mine is ventilated through working shaft and air shaft, which keeps the workings cool and fairly comfortable for men.

Mechanical equipment is of the best, in good running order and includes a 16-drill capacity air compressing plant, Webster Camp & Lane second motion hoist and supplementary additions, workshops, etc., for doing mine work. Everything in and about the mine runs satisfactorily.

Mining captain, James Mathews; engineer, J. R. Reigarh; chief clerk, W. M. Sterling. Postoffice address, Ishpeming, Michigan.

MAAS MINE.

This is a developing proposition with good prospects ahead for making a substantial mine. The mine location is situated northeast of the city of Negaunee, in Section 6, Town 47, Range 26. Eighty-seven men are employed and a fine four-compartment shaft is being sunk in the foot-wall side of the ore body. When ready to produce the ore body will be reached through cross-cuts driven from shaft. Shaft is 8x12 feet in dimensions, substantially constructed and 1,136 feet deep. Broken rock is lifted out of the shaft and works by a geared hoist good for present requirements and for some time to come. The air compressor in service has a capacity to operate ten machine drills. Six are being operated at the present time. The work of developing the property is conducted on practical, systematic lines. Everything is modern and up-to-date. The property will be developed in the best manner for bringing the best results. Progress has been substantial and of the kind that will count when production begins. The place looks well. When in commission, skips will be operated in balance and tram-cars will be operated on electrical haulage. Shaft sinking done during 1906 was 236 feet. Mine will be ventilated by drift connecting with the Negaunee mine from the 700-foot level. Present equipment is only temporary, being used to sink the shaft and open up drifts. When Maas enters the ranks with the producers, it will make a fine record. Enough is known to warrant the assertion that the property will develop into a fine business enterprise.

Superintendent, S. R. Elliott; mining captain, Jos. Thomas; engineer, J. R. Reigarh; chief clerk, E. A. Doty. Postoffice address, Negaunee, Michigan.

STEPHENSON MINE

Stephenson is a developing proposition located at Princeton in the Town 47, Range 27. No shipments of ore have yet been made from there. Property has a very promising outlook and the management is developing the mine on practical lines, and putting it in condition for substantial results when ready to begin producing. The average number of men employed during 1906 was 41 and 3 power drills were operated.

Development work is conducted through one fine shaft, 13′ 2″ x 17′ 2″ in dimensions and 467 feet deep.

Mine equipment will be new, of the best and includes a Rand Straight Line compressor about to be installed, a Sullivan Corliss hoist for skips, an Allis-Chalmers Co. 14″ x 26″ geared hoist for cage, and other necessary appliances consisting of up-to-date workshops and substantial mine buildings, etc.

Superintendent, G. R. Jackson; mining captain, John Ellis; engineer, B. A. Middlemiss; chief clerk, Arthur Uren.

SOUTH JACKSON MINE

Superintendent, S. R. Elliott; mining captain, William Penglase; engineer, J. R. Reigarh; chief clerk, B. I. Wallace. Post office address, Negaunee, Mich.

This is an open pit proposition located just southwest of the city of Negaunee and produces a Hard Hematite ore running about 46 per cent iron and manganese combined. The product is taken out by benches formed and underhand work. The future outlook for the property is considered good. The property is well managed and the product mined very economically. No product was mined in 1906, operations having been confined to development work. During the year, a shaft was sunk to a depth of 50 feet. Shaft is 7x15 feet in dimensions and three-compartment. When going skips will operate in balance, dump automatically and lift good.

Equipment includes a double engine 4-foot drum, No. 8 McCully crusher and supplementary additions and fittings for doing mine work.

NORTH JACKSON MINE

This is an old pioneer mine and bears the honor of being the first iron ore property opened and worked in the entire Iron Range of the Lake Superior district. From its ores was manufactured the first iron and steel produced in the state, and on the lands that now form the company's property the first iron ore deposit, of which there is no record, was discovered. That discovery led to others of vast importance and the good work continued until the Lake Superior district has become the most notable iron ore producing spot on the globe.

JUST UP FROM LAKE ANGELINE MINE, ISHPEMING

The property has been in active operation for upwards of half a century, and for many years was quite a heavy producer of high grade ores of both hard and soft varieties. It has contributed in a substantial way to the success and prosperity of the iron industry in its varied forms besides adding to the renown and prestige of the Lake Superior region. The first regular shipments made, which might be called regular, were in 1856 and amounted to 5,000 tons, certainly a very creditable beginning for those times. Aggregate shipments since that date amount to nearly 4,000,000 tons of ore.

Location is situated within the corporate limits of Negaunee, a growing town of about 8,500 inhabitants, on the line of the C. & N. W. Ry. Realty holdings include all of Section 1, Town 47, Range 27.

During the shipping season, 20 men were employed and 4,869 tons of ore shipped in 1906.

Mine is an open pit proposition with a skiproad constructed on the face of the pit, which will operate in balance when going.

Trams are operated by hand labor. Equipment includes one small double hoist, which will be replaced by new plant before shipping season opens.

Superintendent, S. R. Elliott; mining captain, William Penglase; engineer, J. R. Reigarh; chief clerk, B. I. Wallace. Post office address, Negaunee, Mich.

IMPERIAL MINE

Imperial is situated near Michigamme, Mich., and shipped no ore in 1906. Ore body mined is Brown Hematite. Analysis: Imperial 52.44 per cent iron.

Property is opened by two shafts 8 x 8 feet in dimensions from the bottom of open pit, which is about 100 feet from surface. Skips operate singly and carry one ton to a trip. Depth of shafts: East shaft 109 feet and West shaft 118 feet. Daily capacity of the mine is about 450 and the caving system is used for taking out the product. Two small air compressors are used, an Ingersoll Sargent 3-drill capacity and a Rand of the same size. One 18x25-inch hoisting engine with two five-feet drums is also included in the equipment.

Property is operated in the most practical way for getting the best results generally.

Mining captain, Fred Ware; engineer, J. R. Reigarh; chief clerk, S. T. McKercher. Post office address, Michigamme, Mich.

OGDEN MINE

Ogden lies south of Negaunee in Town 47, Range 27, and is an open pit mine producing a Hard Hematite ore running 41.50 per cent iron and 10.40 per cent. phosphorus. Mine was idle during 1906. Post office address, Ishpeming, Mich.

SMITH MINE

Smith is located at Princeton and forms a prospect. Shaft sinking is about to be started. Postoffice address, Princeton, Mich.

Superintendent, G. R. Jackson; mining captain, August Foggerberg; engineer, B. A. Middlemiss; chief clerk, Arthur Uren.

LUCY MINE

Lucy is a Negaunee property and has been idle for the past three years. Superintendent, S. R. Elliott. Post office address, Negaunee, Mich.

PITTSBURG & LAKE ANGELINE MINE

This company was organized in 1861, by men of the best type, who knew a good thing when they saw it, and how best to develop its resources for bringing the best results. For many years the property has been a substantial producer, a fine business enterprise, developing the resources of the region and contributing in no uncertain way, to its natural growth and prosperity. The property is ably and skillfully managed and for the best interests of the company, and its future well-being. From time to time big sums of money have been spent in sinking shafts, driving levels, developing ore bodies and providing powerful mine plants for dispatching work in an efficient and economical manner.

Future prospects of the property are reported to be bad, no work being done at the mine aside from taking out a few small pillars. That this is so will be regretted by everybody in the iron region. Still mines can't last forever, but Lake Angeline has been a splendid property and is credited with having produced since the beginning of operations, 7,501,379 tons of ore.

General manager, Thomas Walters; mining captain, W. H. Tregambo; chief clerk, G. R. Persons; engineer, Rudolph Erickson. Post office address, Ishpeming, Mich.

Company's property is located within the corporate limits of the city of Ishpeming, in Section 15, Town 47, Range 27 and consists of 5,400 acres of land including both Old and East End mines. Ores produced are high grade Brown-Specular Hematite. Analysis: Angeline Hematite, 65.10 F. E., .044 phos. South Angeline, 63.29 F. E., .111 phos. No. 1 hard ore, 66.96 F. E., .014 phos. Shellield, 66.10 F. E., .035 phos.

In 1906, on an average, 450 men were employed for both the East End and Old mines, and 10 machine drills were operated. For both mines, 201,462 tons of ore were shipped. The mine is operated through one main shaft 700 feet deep and a sub-shaft 290 feet deep. The average length of openings in ore body vary from

1 to 300 feet and one level is being extended from shaft. The product is being taken from the 4th, 6th and 10th levels and the ore is hoisted in skips carrying 2½ tons to a trip. Ore product comes from different levels and is mined on the "top-slicing" method which works admirably. Shafts are connected at various levels and underground workings are well ventilated and comparatively safe and comfortable for working in. No reasonable work is omitted nor expense spared that would result in making the mine safe. The ore occurs within folds of diorite making north of east about 30 degrees and dipping westward. Tram-cars are operated by electricity and answer admirably for the work and much appreciated by the men. The amount of timber used in the mine annually for holding up the ground and other purposes is about 300,000 lineal feet, 10 inch boards.

The mine plant is efficient and powerful, in good running order and adequate for requirements. Mine buildings and power houses are substantial and well located for direct service. It includes a 25-drill capacity Rand compressor, two Corliss and one Westinghouse engine, besides well equipped shops and supplementary appliances that go to fill in and round out a complete plant. I visited the property in January, 1907.

ROLLING MILL MINE

This mine is operated by the Jones & McLaughlin Ore company.

General manager, Thomas Walters; superintendent, Thomas P. Walters; mining captain, Edward Corey; chief clerk, Elmer E. Jeffery.

The property is situated in Town 47, Range 26, and consists of 80 acres of land. The average number of men employed during 1906 was 40 and four machine drills were operated. The ore body mined is a Brown Hematite with analysis of ore not yet given. This is a development proposition. The output of ore reported for 1906 was 3,000 tons. Operations are conducted through one shaft, 10 x 12 feet within timbers and 645 feet deep. Skips are operated singly and carry 2½ tons to a trip. Shaft sinking during 1906 amounted to 500 feet and about 1,000 feet of drifting was extended exploring new ground. Development work underway consists of drifting and looking for fresh ore reserves. The product comes from a depth of 645 feet. Future prospects are considered fair, but a great deal of rock was encountered in the development work. The property is being opened up and developed on modern methods of mining and when in full swing, it will be efficiently and economically operated. The management is among the best. Tram-cars are operated by hand labor and mine ventilation, so far, is good.

Equipment includes an E. P. Allis 2-foot drums, one operating skip and the other, cage.

The property is in good condition and well worked and the management aims to work it the best way for bringing the best results.

MARY CHARLOTTE MINING COMPANY

This mine has 80 acres of mineral land situated in Town 47, Range 26, and located about three miles southeast of the town of Negaunee. Property is managed with energy and substantial progress has been made in all its departments. Ore is Hematite. Since the beginning of operations, this mine produced 306,941 tons of ore. Product for 1906 was 273,093 tons as compared with 236,703 tons for 1905.

"Caving" system is used for taking out the product and tram-cars are operated by hand labor and mules. Mine ventilation is first-class and about 346 men were employed during 1906.

Mine is developed through one large substantial shaft, 7x18 feet in dimensions, three compartment and 182 feet deep. Skips balance and carry two tons to a trip. Ore body from which the product comes is large and continuous and is opened up ahead for some time to come with three levels averaging 500 feet in length extended to and in the ore bodies mined. Every department runs smoothly and the mine is in fine physical condition. Mine looks well and is in a prosperous condition and bigger and better things are predicted for it. Mine buildings and power houses are substantial and located for direct work and bring the best results. Surface equipment is efficient, adequate for requirements and economically operated. It embraces a two-boiler Webster-Camp hoist, an eight drill capacity compressor, besides mine buildings and fittings for doing the work of the company.

General manager, E. N. Breitung; mining captain, Joseph Hodgson; superintendent, J. F. Foley; engineer, W. St. Clair; clerk, R. C. Dutton.

THE REPUBLIC MINES.

The Republic Iron Company operates the Republic and West Republic mines. Postoffice address, Republic, Mich. William Kelly, general manager.

Realty holdings are situated in Town 46, Range 29. The average number of men employed during 1906 was 461 and the amount of ore produced 162,945 tons. The ore mined is a Hard Specular and Magnetic mineral and it about holds its own. The back stoping method is used for taking out the product and it answers first-rate. Four active shafts are operated and in good condition. Skips are operated in balance and singly and three tons of ore is hoisted to a trip. The deepest shaft is 1,850 feet deep. Shaft sinking done during 1906 consisted of 156 feet and the number of feet drifted, 3,063 feet. Three air compressors are operated, one of which is driven by water power and the other by steam power. The daily capacity of the mine is about 600 tons.

This mine is located in the town of Republic, on the line of the C. M. & St. P. Ry. For many years the mine has been a successful producer, sending out annually a good round product of high grade ore. It

has been vigorously operated and formed the mainstay and principal support of the town. Since the beginning of operations, the property is credited with having shipped a total output of 5,602,293 tons of ore, including West Republic. The property is skillfully managed, and with a view to taking out the best there is in it, and at the same time, its future is not overlooked. Though the mine has been a substantial producer for many years and a fine business enterprise, it still contains large ore reserves of excellent quality. Ore bodies, however, are somewhat irregular but persistent and abundant. Openings are well ventilated and comparatively comfortable for working in. Nothing is left undone to make the underground department safe and secure to take out the product. Power houses are substantial, conveniently located for direct results and economical operation. Equipment is powerful, highly efficient, in good working condition and adequate for requirements. Improvements completed during 1906 include a new changing house for the men. West Republic practically forms a part of the Republic and adjoins it. The mine is managed by the same official force. In 1906 there was employed for all purposes 25 men on an average and the output of ore produced was 3,629 tons. And the product of the West Republic is usually included in that of the Republic.

EMPIRE IRON COMPANY.

This company is developing a mine near Palmer in Marquette county, and holds, under lease, 80 acres of land. About 25 men are employed and the development work underway includes sinking a shaft for the purpose of developing an ore body. The shaft is a fine one being 6'x12' in dimensions, and three-comparement. The work is well in hand and conducted on up-to-date methods and on lines that promise to bring the best results. People behind the proposition know the business and are doing it right. Progress has been substantial and the management expects to have the property in condition for sending out ore the present season. The ore body under development runs about 45 per cent metallic iron and looks distinctly promising. Possibilities for the property are large and indications are that it will develop substantial values and form a fine business enterprise. Mechanical equipment has not yet been installed, but it will be new, and when completed, efficient and fully adequate for requirements and economically operated. The "milling" system will be used for taking out the product which is, perhaps, as practical as any in vogue.

A. C. Jones, general manager; O. H. Symons, mining captain; Charles Craney, clerk. Postoffice address, Palmer, Michigan.

RICHMOND MINE.

This is an open pit and low grade ore proposition, there being no shafts. It is located just south of the town of Palmer in Town 47, Range

26, and consists of 40 acres of land. Sixty-five men were employed during 1906 and 89,563 tons of ore produced. Progress has been substantial and operations are conducted in a practical way. This property is ably managed and opened up with a view of getting out the best there is in it in the best way. The ore, when mined, is loaded into small cars, and these cars are hauled out of the mines with horses and mules and the ore run through a crusher and loaded into railroad cars. It is necessary to crush all the ore before shipment. The ore is mined at a cheap cost. The work of taking out the product is readily and economically performed and this mine is only in operation during the shipping season. Equipment now includes one Gates Crusher and a Corliss engine.

General manager, J. R. Thompson, Ironwood, Mich., John Huhtala, captain; B. C. Hayes, chief clerk. Postoffice address, Palmer, Marquette Co., Mich.

REPUBLIC IRON & STEEL COMPANY.

This company operates the Cambria and Lillie mines.

General manager, C. F. Fairbairn; superintendent, John Deacon; mining captain, A. Datson; engineer, L. Peterson; chief clerk, John E. Nilson. Postoffice address, Negaunee, Mich.

CAMBRIA MINE.

This mine is located about a mile and one-half northwest of the town of Negaunee, on the line of the C. & N. W. Ry., in Sections 35 and 48, Town 46, Range 28, with 84 acres of land. Previous to 1906, the company produced a total output of 1,500,000 tons of ore. The 1906 product was 65,432 tons of ore. Average number of men employed during 1906 was 75 and eight power drills operated. Ore body mined is a Hematite irregular in trend and formation, but persistent and strong. Ore mined runs 59.50 per cent iron and .060 per cent phosphorus.

Mine is operated through one shaft, 6x10 feet in dimensions and 818 feet deep. All told, 13 levels are extended from shaft and the product is recovered from the 11th, 12th and 13th levels. Ore is hoisted in skips carrying 1⅔ tons to a trip operated singly. During 1906, about 1,500 feet of drifting was done and the average length of openings in the ore body is about 200 feet. Daily capacity of the mine is about 400 tons. A Rand Compressor, 20-drills, are operated and tram-cars are operated by hand labor. Method in vogue for taking out the product is "Top-slicing" system, which is among the safest and most economical methods in use. 15,000 feet of timber are consumed in the mine annually.

Face of openings are in ore of good quality and deposit looks strong and continuous. Bodies of ore are opened up on different levels that will last for some time to come, and the deepest points penetrated look as well as any place in the mine. From time to time, considerable sums of

money have been spent in strengthening the position of the mine, and the success achieved has been, upon the whole, satisfactory. The management aims to get out the best there is in the property and development continues on a vigorous scale. Mine looks good for from 60,000 to 70,000 tons annually. Equipment is good for present requirements and in first class running order. The property is well managed and for the best interests of the company. I visited these properties last summer and everything appeared to be running along nicely and doing full duty.

THE LILLIE MINE.

This mine adjoins the Cambria and lies in Section 35, Town 48, Range 26 and owns 70 acres of land. It is managed by the same official force and has the same postoffice address.

During 1906, 55 men were employed on an average and two power drills were in regular operation. The ore body mined is a Soft Hematite, but very irregular in formation. Analysis of ore mined: 59.50 per cent iron and .070 per cent phosphorus. One shaft, 6x10 feet in dimensions and 904 feet deep is in operation. Three-ton skips are operated singly for hoisting the product of ore. During 1906, about 1,000 feet of ground was drifted through and 350 feet of cross-cuts were driven. The average length of openings in ore body is about 150 feet and in all, 9 levels are extended from shaft. Development work underway is conducted on the second and sixth levels and from these levels the product is mined. The daily capacity of the mine is about 400 tons and in 1906, the product amounted to 38,724 tons of ore. The total number of tons of ore produced previously to 1906 is 1,550,000. Tram-cars are operated by hand labor and the method in vogue for taking out the product is "Top-slicing." Amount of timber used in the mine annually for all purposes is 6,000 feet. Levels are connected at different points, and men may go from place to place whenever they desire or in cases of emergency. Ventilation is good and the workings are comparatively comfortable. Equipment is efficient, in good working condition and capable of doing the work of the mine.

Mechanical equipment includes a 10-drill capacity air compressor, hoisting engine, 21x24 cylinder, with 8-foot drum, three tubular boilers with supplementary additions and fittings adequate for general requirements. The plant is in good condition and running smoothly. I visited the property last summer.

MENOMINEE RANGE.

On the Menominee Range the Oliver Iron Mining Company operated during 1906 the Chapin, Aragon, Mansfield and Riverton mines. The Cundy, Cuff and Hill Top mines are still idle and nothing further can be said aside from the notes given in my previous report.

O. C. Davidson, general superintendent; Geo. J. Easele, assistant superintendent.

CHAPIN MINE.

Chapin still holds the distinction of being the heaviest iron ore producer in the State of Michigan and forms one of the most substantial and remarkable mines on the whole iron region of the Upper Peninsula. It has solid merit, forms a splendid business enterprise and is the mainstay of the town of Iron Mountain. Its first shipment was made in 1880, which amounted to 74,000 tons of ore. Since the beginning of operations it is credited with having produced 14,347,851 tons of ore. Its ore shipments during 1906 amounted to 921,209 tons as compared with 956,968 tons sent out the previous season.

Analysis of ore: Chapin grade, Iron, 58.65; Phosphorus, .064; Ajax grade, Iron, 52.60; Phosphorus, .060.

The ore bodies mined consist of a series of lenses extending easterly and westerly for 6,100 feet in length. The greatest depth reached is in the Hamilton shaft, 1,418 feet. It varies from 50 to 150 feet in width.

Underground operations are conducted through two fine shafts, substantially constructed and in first class running order. Shafts are Hamilton and B. Ludington. Hamilton is 7x21′ in dimensions, three-compartment and 1,418 feet deep. B. Ludington is 7x18′, three-compartment and 1,324 feet deep. B. Chapin shaft is 1,023 feet deep, and C. Ludington is 1,510 feet deep. The average number of men employed during 1906 was 931 and 65 power drills were operated. Opening and development work done during the year consisted of shaft sinking 244 feet, drifting, 3,500 feet, crosscutting, 2,000 feet and raising about 2,000 feet. Total opening work, 7,744 feet.

During the past year, an engine house 70x42′, located at "C" Ludington shaft has been completed. In this building is installed the large Cornish pumping engine formerly in use at "D" shaft, Chapin. There has also been erected at "C" Ludington shaft a steel head frame, height 114′ 6″. A boiler house 51x69′ has also been erected and in it six horizontal tubular boilers, 72″x18′ have been installed. These boilers furnish steam for operating the Cornish pumping plant. An annex to "B" Ludington engine house has been completed during the past year, in which will be installed one 30x60 Single Cylinder Reversing engine to be used for operating the cage in the new "C" Ludington shaft. Aside from building a coal trestle at the "C" Ludington power plant and other minor improvements. The above covers everything contemplated in the way of improvements of equipment at the Chapin mine for 1907.

Order prevails everywhere and practically every department runs to perfection. I have visited the property on different occasions and was always impressed with the way work is done there. Hamilton shaft, I think, holds the record of the district for big hoisting. Two years ago, when on a visit to the district, one of the mining captains of the mine told me they hoisted and dumped to stockpile 2,530 tons of ore in one night shift of ten hours. "That is certainly going some." The

shaft has a fine hoisting plant with a pair of 24x48" hoisting engines operating two reels with over-winding flat wire ropes one-half inch thick and four inches wide. Underground openings are developed on broad practical lines with shaft and levels connected at numerous places making the workings a veritable network. Air circulates freely through connections and make practically every part of the workings comparatively comfortable for all engaged in the underground work. The product is recovered by the "caving system" making the mine secure against accidents and permitting the taking out of practically all the ore as the work proceeds. An electric haulage system is used for tramming the ore, which works to perfection. Twelve cars are considered a load for a motor, but at times as many as fifteen cars are hauled.

Trams dump in pockets formed in the ends of shafts which in turn are emptied into skips. Each pocket holds just a skip load. An apron is adjusted to a pocket operated by a wheel. With a twist of the wheel, the pocket is emptied, the skip filled and is away towards the surface like the wind. The work is readily and economically done. Skips counterbalance in shafts, carry five tons to a trip and dump automatically. Future requirements are anticipated in good time and provided for when needed. The usual number of openings are going forward and developing fresh reserves in accordance with the policy of the management. Location and works are lighted by electricity.

"C" Ludington shaft is a wonderful shaft and one of the most notable ones in the iron region of the Lake Superior district. It is vertical with inside dimensions of 24'3"x10'4". It has four compartments, as follows: One cage, 5x10'4"; two skips, 5x6'; one pump and ladderway, 9'3"x 10'4". The shaft is steel-lined throughout, the material consisting of steel rail and "I" beams with sets four feet apart, and when finished will have reached a depth of 1,500 feet, which will be 300 feet below the present 14th level, and to which it is proposed to drain the bulk of the water of the Chapin mine from where it will be pumped to surface by a large Cornish pumping plant. This new shaft is connected with the level known as the 14th, at a depth of 1,201 feet. As soon as the ore above the present working level, known as the 12th, has been removed, which will probably be in the course of the next few years, it is proposed to make the 14th level the working level.

The Chapin is one of the wettest mines on the whole ranges, making steadily from 2,800 to 3,000 gallons of water per minute. The bulk of this water has been handled through the Hamilton or No. 2 shaft.

Chapin equipment is of the best, highly efficient and in good running order. Buildings are substantial and located for giving the best results. Workshops are equipped with modern tools and fittings for doing mine work and turn out everything needed except new machinery.

Mining captain, Martin Goldsworthy; chief clerk, John A. Ryan; engineer, S. J. James.

ARAGON MINE.

Aragon is a substantial mine and located in the town of Norway and forms a main support of the town. Mine location lies in Section 9, Town 39, Range 29, and consists of 120 acres of land.

Mining captain, G. A. Alvar; engineer, G. A. Hellberg.

The average number of men employed during 1906 was 542, and 45 power drills were in operation. Ore produced is a Hematite. Analysis: Granada grade, iron 58.50 per cent, phosphorus, .060 per cent; Cadiz grade: iron 50 per cent, phosphorus .55 per cent.

Shipments of ore for 1906 amounted to 416,215 tons as compared with 430,134 tons shipped during the previous year. Since the beginning of operations, the mine has produced a total output of 4,921,305 tons of ore. That certainly forms a creditable record and the mine is still in good condition for a substantial product and in fine physical condition. Mine is opened and developed through two working shafts, No. 4 and No. 5. No. 4 is 1,000 feet deep while No. 5 is 1,050 feet deep. Both shafts are in good running order and substantial in every particular. The amount of opening and development work during 1906 was 2,500 feet.

During the past year there was erected at the Aragon mine a new building for use as a carpenter, blacksmith and machine shop. The dimensions of the structure are 48x170 feet. The building is frame, brick lined, iron clad and its foundation is stone. A new office building and warehouse combined, 28x90 feet, frame, brick-lined, iron clad, was also completed during the year, besides a new laboratory, 20x40 feet, frame, iron clad structure. The management now contemplates erecting a new change house to be located at what is known as No. 5 shaft, Aragon Mine. The present dry, located at No. 2 shaft, is situated on caving ground and being an old building will not permit of moving. The new change house referred to will take the place of the old dry house named.

Development work and general mining is conducted on practical methods and the product is taken out in the best way for the ore body mined. The "caving system" is used and answers well. It protects the mine from accidents and permits taking out practically all the ore body as the work proceeds. Levels are going forward in the three shafts developing ore reserves with openings averaging 1,370 feet in length. Underground openings are extensive, forming quite a network and contain some fine stopes. Every department, both underground and on surface, was running vigorously and order prevailed everywhere. Every effort is made to make the mine safe and up-to-date. About 600,000 feet of timber, board measure, is consumed annually in this mine. Ore body mined is continuous and good for many years' work at the present rate of production. Tramming is done by pneumatic locomotives. Trams dump directly into skips, which are hoisted to surface and in turn dump in ore cars and the load is transferred to the stockpile. The work is readily and economically done. Operations are conducted on practical lines and the management aims to

get out the best there is in the property and in the most business-like way. Results accomplished have been fairly substantial and satisfactory. Mechanical equipment is of the best, in good running order and includes hoisting plants, an air compressor plant, pumping outfit, workshops conveniently located, and supplementary appliances adequate for requirements.

RIVERTON MINE.

Riverton combines the Dober and Iron River mines located at Stambaugh in Town 42 and 43, Range 35, consisting of 60 acres of land. Post-office address, Stambaugh, Mich. J. S. Wall, district superintendent; Harry E. Duff, mining captain; Wm. H. Crago, engineer.

The underground developments are conducted through one main substantial shaft, 6x14 feet in dimensions and 485 feet deep. Operations are dispatched in the most practical way for bringing the best results and substantial progress has been made. Average number of men employed in 1906 was 154 and 12 power drills were in operation. Ore shipments for the year amounted to 138,083 tons as compared with 111,749 tons shipped the previous year. Total amount of ore shipped out since the beginning of operations is 808,846 tons. Skips operate in balance and carry 2½ tons of ore to a trip. Shaft sinking done during the year under review was 97 feet, drifting and crosscutting, 1,375 feet. Total opening work, 1,472 feet.

Ore produced, Hematite. Analysis: Brunswick iron, 56.00 per cent; phosphorus, .650 per cent; Barton Iron, 58.00 per cent, phosphorus, .585 per cent. Management aims to get out the best there is in the mines, and progress with a view to getting better results has been substantial and of the kind that counts. Ore bodies contained in the mines look well, and ten levels in all are being extended, developing fresh reserves for future needs. No effort or expense is spared to make the mine safe and comfortable and about 300,000 feet of timber, board measure, is consumed annually in mine work. Openings are extensive and contain some fine stopes that will turn out well. A number of improvements have practically been made all over the mines and their position strengthened in many ways. In the Iron River mine the "square sets system" is used for taking out the product and in the Dober, the "milling system" is used. These systems are practical and bring satisfactory results. Mines are in good physical condition and economically operated. Mechanical equipment is of the best—practical, modern, located and arranged for direct work and the best results. Mine buildings are substantial and well equipped.

Tramming is done by hand labor. Trams dump directly into skips, which are hoisted to surface and in turn dump in ore cars and the load is transferred to the stockpile. The work is readily and economically done. Operations are conducted on practical lines and the management aims to get out the best there is in the property and in the most business-like way. Results accomplished have been fairly substantial and should

be, in the main, satisfactory. Mechanical equipment is in good running order, and includes hoisting plants, a 24 drill Rand compressor plant, pumping outfit, workshops conveniently located and supplementary appliances adequate for requirements. Plant is in good running order and capable of doing practically any mine work.

MANSFIELD MINE

This mine is located in the village of Mansfield, Section 17, Town 43. Range 31, with 132 acres of land. Town is named after the mine, and of this it forms one of the main supports. Mansfield has been operated off and on for about a dozen years, but have not succeeded in becoming a heavy producer. Since ore was first lifted out of the property, it is credited with having produced 96,160 tons of ore, all of which was added to the stock and none shipped out. The 1905 product was 39,875 tons. Ore analysis: Iron 59 per cent; phosphorus .115 per cent. Average number of men employed was 98 and 8 power drills are in operation. Daily capacity of the mine is about 600 tons. Product is recovered from the 12th level and the amount of development work done during 1906 was 517 feet. Skips operate in balance and carry 3 tons to a trip. Mine is developed by means of one working shaft, three compartment, 16x7 feet in dimensions and 1,058 feet deep. Product is taken out on the "slicing system" and no timber is used, only for shaft repairs. Operations are conducted with marked ability and mine is opened up on up-to-date methods. Underground openings are connected at various places and the workings are well ventilated. Development work and opening up reserves of ground for future needs goes forward steadily and eight levels averaging 1,240 feet in length are extended from the shaft into the ore body mined. Openings are extensive and contain some good stopes of ore, but the mine has its limitations. Development work is continued in the most practical way for bringing the best results. Mine is ably managed and in a prosperous condition. Future outlook is fairly promising and bigger and better things are anticipated. Mechanical equipment is actuated by steam power. Tramming is done by hand labor and mule power. Trams dump directly into skips, which are hoisted to surface and in turn dump in ore cars and the load transferred to the stockpile. The work is economically and readily done. Mechanical equipment is in good running order, and includes hoisting plants, an Ingersoll-Sargent 33-drill capacity air compressor plant, pumping outfit, workshops conveniently located and supplementary appliances adequate for requirements.

J. S. Wall superintendent; Jas. P. Edwards, mining captain, W. H. Crago, engineer.

MICHIGAN IRON MINE.

The Michigan is situated on the loop of the C. M. & St. Paul Rail-

way, and lies in Section 9, Town 44, Range 33 and consists of about 40 acres of land.

Postoffice address, Amasa, Michigan; J. P. Edwards, mining captain.

One hundred men are employed and about six machine drills are operated on an average. Mine is developed through one shaft, 16x6 feet, and three-compartment. It is 518 feet deep with five levels extending into the ore body for an average length of 250 feet. Daily capacity of the mine is from 200 to 250 tons of ore. Ore produced, Hematite, running 55.00 per cent iron and .285 per cent phosphorus. Mine openings are developed on practical lines and worked the best way for bringing the most satisfactory results. Levels are connected at different points and underground openings are well ventilated. Management aims to get out the best there is in the property and a number of improvements have been made here and there that resulted in strengthening the position of the mine. Levels are going ahead developing additional ore reserves in accordance with the policy of the management. Future needs and requirements are anticipated and planned well in advance of actual necessities. Physical condition of the mine shows a steady improvement and there are better things ahead for it. The product is recovered on the "slicing method" which answers first-rate, and requires but a moderate quantity of timber in conducting the work. No system succeeds better, I think, for taking out practically all the ore contained in a deposit in the cleanest way for "slicing." Mine is well managed and looks promising. Mechanical equipment is powerful, efficient, in good condition and adequate for requirements. Mine buildings and location are lighted by electricity. 23,694 tons of iron ore was produced during 1906.

THE PEWABIC COMPANY.

The Pewabic company is a Wisconsin corporation with its general financial offices located in Milwaukee. The general mine office is located at Iron Mountain, Mich. President, George Van Dyke.

General manager, E. F. Brown; mining captain, Ed. J. Lord; chief clerk, W. G. Monroe; engineer, A. J. Myers.

On different occasions, I have visited the property of this company, but never without being favorably impressed with its general appearance and the smooth and efficient manner in which each department connected with the mines were running. The management appears to know the business thoroughly and do it in the best way for bringing the most satisfactory results. Practically every department appears to be going along to perfection and doing first class duty. Everything seems to be looked into in good time and the future requirements are anticipated and provided for in due season. The general appearance of the property indicates prosperity and the best of management. Nothing seems to be

neglected, no matter what its significance may be. It is run on up-to-date methods and progress has been substantial and of the right kind.

Number 3 shaft has been sunk deeper, levels have been extended further into new ground and fresh reserves of ore have been opened up and put in condition for economical extraction. Where needed, the equipment has been improved and upon the whole, the position of the property has been strengthened. This is as it should be and must be kept up or the product will soon reflect the neglect and the cost sheet show an increased cost per ton of ore produced.

Pewabic mine is situated just northeast of the town of Iron Mountain in Sections 30, 31 and 32 in Town 40 North, Range 30 West, with 880 acres of land.

The ore body mined is Soft and Medium Hard Hematite.

The mine is operated through four active shafts: No. 1 is 6x14½ feet in dimensions and 823 feet deep; No. 2, 7x20 and 521 feet deep; No. 3, 6x9½ and 381 feet deep; Walpole No. 2, 6x9½ and 678 feet deep. Skips lift two tons to a trip and are operated in balance and dump automatically. In 1906, No. 3 shaft was sunk 110 feet and the number of feet drifted was 2,647; crosscutted, 2,205 feet. Total opening work, 2,315 feet. Average length of opening work in ore body, 1,165 feet and the number of levels extended altogether are seven. The product is taken from the first, fourth, fifth, sixth and seventh levels. The average number of men employed is 518 and 31 power drills are operated on the average. The daily capacity of the mine is about 1,600 tons. The amount of ore shipped in 1906 was 476,403 tons. Total number of tons of ore produced was 3,611,622.

The Walpole mine adjoining the Pewabic is now and has been for several years, operated by this company. Its operations are covered in the figures given above. The figures given for drifting and crosscutting do not include the temporary openings made in the sub-levels or the undercutting for block caving.

No effort has been left undone or expense spared to make the mine safe. About 850,000 feet of timber is consumed annually for supporting and holding up the ground in order that the ore may be stoped out or caved, as the case may be, with safety to all connected with the work. The block caving method is most largely used in producing ore. Where the ores are very soft, however, sub-level caving is used. Wire rope trams are operated underground and on surface for hauling the ores to and from the shafts. At the Walpole, where the distance is greater than 1,000 feet for moving ores, it has been decided to install an electric haulage to do the work. Mine ventilation is very good. Machinery and power houses are substantially constructed and conveniently located for direct, economical work. Power plants are highly efficient and adequate for requirements. The various workshops are well appointed and fitted with the necessary tools and appliances for doing the work of the mine. The equipment is actuated by steam power. It includes a ten-foot first motion

drum plant with Corliss engines capable of hoisting from a depth of 1,200 feet. Triple expansion pumping engines capable of pumping 4,000 gallons of water per minute from a depth of 1,000 feet, using a steam pressure of 150 pounds to the square inch at the pumps; compound Corliss duplex air compressor with capacity to operate 42 drills. Additions and improvements underway include change house remodeled and equipped with metal lockers and steam heat. The company is now completing the installation of three 300-horsepower marine boilers designed to give 150 pounds pressure for pumping.

CONCENTRATING WORKS.

The Pewabic Company's Concentrating works are situated in Section 32 and 33, included in Pewabic mine.

E. F. Brown, general manager; W. G. Monroe, chief clerk; Peter Roffin, mining captain; A. J. Myers, engineer.

For ten months in 1906 at these works, 50 men were employed and 5,617 tons of concentrates were produced. Previous to 1906, all products were included in the reports of the Pewabic mine. The daily capacity of the works is about 300 tons crushed ore. The works is an open pit and sub-level caving proposition.

Equipment consists of small mining outfit and concentrating mill, a detailed description of which was given by Mr. L. M. Hardenburgh, E. M., in a paper read before the L. S. Mining Institute during its annual meeting in 1900. (See Vol. 6, page 23 of proceedings).

NANAIMO MINE.

This mine is also operated by the Mineral Mining Company, a Wisconsin organization, with headquarters at Milwaukee, Wisconsin.

President, George D. Van Dyke; general manager, E. F. Brown; chief clerk, W. G. Monroe; mining captain, Ben Martin; engineer, A. J. Myers. Postoffice address, Iron Mountain, Mich.

Property is located in Section 26, 43 and 35 with 120 acres of land. The Nanaimo was one of the first mines to be opened in the district, although it had never been extensively opened. It was taken over by the Mineral Company in 1903 previous to which it had been idle two or three years. The mine looks well now. The ore bodies are substantial, and apparently good for many years to come. The mine is opened to the fourth level, down 362 feet and the showing in the bottom is as good as in any of the workings. A modification of the sub-level caving method is used in winning the ore and it works admirably without using a great deal of timber. The annual consumption of timber thus becomes nominal, which is an unusual feature and means much to the company. Timber costs run into money fast, to say nothing of the expense of handling.

The average number of men employed during 1906 was 125 and 16 power drills were successfully operated. Ore body mined is a Soft Hematite.

The mine is opened and developed through one shaft, two-compartment, and substantially constructed. Skips lift two tons of ore to a trip and operate singly, dumping automatically in the ore cars. The number of feet drifted during 1906 was 835 and the number of feet crosscutted was 1,110. Total opening work done during the year was 1,945 feet. This is new work and of the kind that counts. The average length of openings in the ore body is about 650 and three levels are extended from shaft. Product is being taken from the 2nd and 3rd levels and results are quite satisfactory. The property is operated on up-to-date methods and economically managed. It is under the same management as the Pewabic mine. The daily capacity of the mine is about 350 tons. 93,569 tons of ore were shipped in 1906 as compared with 90,722 tons shipped the previous year. Total number of tons of ore produced, under the present ownership, 103,893.

Tramcars are operated by hand labor. No ordinary expense is spared in making the mine safe for working in and mine ventilation is very good.

Mine equipment includes one Ingersoll-Sargent Compressor, 16 drills, three 100-horsepower boilers, one 18x8x18 Duplex Prescott pump, two 11x16x4′ drum Lake Shore Engine Works hoists, machine and blacksmith shops and all other necessary machinery and equipment for a mine of this size.

Additions made and improvements completed during 1906 was as follows: Machine shop, well equipped, one end of which is used for office and warehouse; an additional hoist for the operation of a second skip and a large compressor.

The Nanaimo, as now operated, includes the property known as the old Beta mine. The drifting and crosscutting given does not include such of this work as is done in the sub-levels in the process of mining. The figures given indicate the amount of opening and exploring on the main levels only. The acreage given above as controlled by this company includes only the Nanaimo mine property in addition to which they have under exploring options in Iron County, 180 acres.

THE BREEN MINE.

This property is also operated by the Mineral Mining Company and under the same practical management. The mine is located in Section 22, Town 39 North, Range 28 West, with 120 acres of land. This is the oldest mine in the Menominee Range, it having been explored in the early seventies. It produced less than 20,000 tons of high grade ore and has been abandoned on account of the low iron contents of its remaining ore, which until recent years was not marketable. During 1906, the mine

employed on an average, 20 men and shipped out 21,004 tons of ore. The ore body mined is hard lean Hematite running 40 per cent metallic iron and .015 per cent phosphorus.

Underground operations are conducted through two shafts, 8x10 feet in dimensions. No. 1 is 100 feet deep and No. 2 is 258 feet deep. During 1906, about 600 feet of drifting and 300 feet of crosscuts were driven with fair success. Average length of openings in ore body is about 800 feet and one level is extended from shaft and from it the product is recovered. The daily capacity of the mine is about 200 tons. Four power drills are operated. Tram-cars are operated by hand labor and the method in vogue for taking out the product is "Open pit Milling." The amount of timber used in the mine annually is nominal.

Equipment includes one Ingersoll-Sargent Compressor, eight-drills, one 100-horsepower boiler, one 7x10 hoist, one No. 8 Cameron pump and other necessary equipment for small open pit mine.

This mine is well managed and economically operated. Everything in and about the property runs nicely. Postoffice address, Naucedah, Mich.

TRADERS MINE.

The Antoine Ore Company operates the Traders mine located in Dickinson county, Mich., and situated in Town 39-40, and Range 29-30. Real estate holdings consist of 591 acres of land.

General manager, E. W. Hopkins; head mining captain, Frank Carbis; chief clerk, W. K. Carter. Postoffice address, Iron Mountain, Michigan.

This property is operated with great vigor and substantial progress has been made. Results accomplished must be very, very satisfactory to all interested in the property. One hundred men were employed and the largest output of ore made in a single year in the history of the property, which was 196,000 tons as against 138,395 tons for 1905. Appearances of the ore body as regards size and quality is large and has all the appearance of a regular vein. Analysis of ore body mined runs 41 per cent iron and .018 per cent phosphorus. One fine shaft, 7x23 feet in dimensions is operated and it returns excellent service. It is 150 feet deep. Ore is hoisted in skips and carry 2½ tons to a trip operating singly. About 500 feet of drifting was done in 1906 and 300 feet crosscutting. Average length of openings in the ore body is 1,200 feet or more than two levels are extended. Development work underway embraces drifting, crosscutting and sinking and everything looks encouraging. The product is being taken out from two levels. Twelve drills are operated and a Rand Imperial 1,300 cubic ft. Air Compressor is operated with a capacity of 1,000 tons. Tram cars are operated by hand labor. Method in vogue for taking out the product is "Milling" and it answers admirably for the work. Scarcely any timber is used in the work.

Mechanical equipment is not large but adequate for requirements. It includes: Three 72x16 horizontal tubular boilers, 750 pounds pressure, 150-horsepower each; one Rand Imperial Compressor, and one 15x20 double cylinder geared hoist. Additions and improvements made during 1906 are as follows: New hoist installed, new boarding house and new change house.

The property is well managed and operating costs are low, which after all, is the main thing. Future requirements are anticipated and provided for in good time. The future outlook for the property is of the best.

YOUNGS MINE.

The Huron Iron Mining Company operates the Youngs Mine and owns 160 acres of land situated in Town 42, Range 35, and located at Stambaugh, Iron County, Mich.

G. W. Youngs, general manager and superintendent; mining captain, John Looney; engineer, Chas. Linstrom; chief clerk, David Youngs. Postoffice address, Iron River, Mich.

Youngs is a new mine with a very bright future before it. During 1906, 100 men were employed and the company produced 50,000 tons of ore, which is first-rate for the first year's work. The appearance of the ore body, as regards size and quality, is good, and it runs from 55 to 60 per cent iron. The mine is opened up on sound, practical methods and in the best way for getting the best results. Progress has been continuous and substantial. The mine is in fine physical condition and looks well. Operations are carried on through one shaft, 6x9 feet in dimensions, 250 feet deep and down to the third level. Product is lifted in skips carrying 2½ tons to a trip operating singly. The shaft was sunk 100 feet in 1906 and the number of feet drifted was about 1,000 feet; crosscutted, 500 feet. Total amount of development, 1,600 feet. The average length of openings in ore body so far is 600 feet. Two levels are being extended and product is taken out from one level. Development work underway consists of drifting, etc. Ventilation is good and the underground department, as mines go, is comfortable for working in. Daily capacity is from 300 to 500 tons. Twelve power drills are operated with an Ingersoll Rand Company 25-drill capacity Air Compressor installed. Method in vogue for taking out product is "Milling" and it answers first-rate. It is comparatively safe and requires but little timber. The equipment is new, of the best, and includes one 25-drill compressor, one 10-drill compressor, one double hoist six-foot drum 16x20 engines, capacity 20,000 pounds hoist, one 1,000 horsepower Heater, two boilers 6x18 feet, one upright boiler 6x18 feet, 15 drills (Rand) full compressor of pumps, office, dry, two boarding houses, blacksmith shop, store house, power house, barns. The company is building 25 houses for employes.

The property is well managed and everything in and about the workings look first-rate and appears to be in a prosperous condition.

About three years ago, G. Walt Youngs and others took an option on this property and commenced to explore it with a diamond drill. One after another associated with Mr. Youngs lost faith in his judgment and dropped out. Mr. Youngs, however, stuck and finally reaped his reward. He deserves it.

PICKANDS-MATHER & COMPANY.

This company controls the Verona Mining Company operating at Quinnesec, Michigan, and the Hemlock Mining Company operating at Amasa, Michigan.

Samuel Mather, president; Walter Scranton, vice-president; H. S. Hasselton, secretary, H. G. Hamilton, treasurer. Main office, Cleveland, Ohio; mine office, Iron Mountain, Mich. C. A. Munger, general manager, Duluth, Minn.; Charles E. Lawrence, general superintendent, Iron Mountain, Mich.

This company has been one of the great factors in the development of the Iron industry and commerce at the Head of the Lakes and on the ranges. From the beginning of work in the ranges, the company has been active—its activities take on varied forms but always important in magnitude and accomplishment. It is one of the institutions which has worked with considerable means and yet in a practical way. All the machinery of the great mining institution is applied to the working of these properties and they are model mines in the operation and equipment. The properties are all in fine physical state. The activities of the company by no means ceases at the production of the ore, for Pickands-Mather are one of the biggest factors in the ore markets and have a prominent place in the lake transportation commerce.

The mines operated by this company are, as a whole, in fine physical condition and in trim to turn out a heavy product, and barring accidents, shipments during 1907 promises a total considerable more than the tonnage sent out in 1906, which broke all former records. The management aims to carry on operations on a scale somewhat commensurate with the possibilities of the properties, and to get out of them the best there may be in them, besides making provision for future requirements. The success achieved has been substantial and gives general satisfaction. The machinery plants are highly efficient as liberal allowances have been spent in putting them in first-class operating condition. The mines are ably and skillfully managed and for the best interests of all connected with the enterprise. The ore bodies opened up and available for production and from which the product of the company comes are large and continuous and amply sufficient to last for some time to come at the present rate of production. The mines are opened on broad, practical lines and worked on up-to-date methods. Order and system is kept well in the foreground

and maintained in every department. The affairs of the company are discharged with promptness and precision in a very capable manner.

The producing mines operated by the Verona Company are: The Baltic, Caspian and Vivian on the Menominee Range, and the Mikado on the Gogebic Range.

BALTIC MINE.

This mine is located at Stambaugh, Iron County, Michigan, in Town 42 and Range 34 and has 200 acres of land. During 1906 the number of men employed was 185 and the amount of ore shipped was 180,625 tons as against 133,000 shipped the previous year. Previous to 1906, there was a total of 502,276 tons of ore produced. Ore mined is a Hematite running 57 per cent metallic iron.

Mine's operations are conducted through one shaft, 7x9 feet in dimensions, and substantially constructed and is 400 feet deep. Mine is being opened up on broad, practical lines and economically operated. Since beginning of work, progress has been steady and substantial. Big sums of money have been spent in its development and equipment. Earnings year after year were spent in strengthening its position. Expenditures have been well placed and will prove an excellent investment. Length of openings in ore body reach 600 feet. The ore body is large and continuous and looks as well in the deepest points penetrated as anywhere in the mine. The "Back-stoping" method is used for taking out the product and it works admirably. Mine is in good physical condition and economically worked. Equipment is highly efficient and includes hoisting engine, air compressor, with three boilers for furnishing power besides supplementary appliances and shops for doing the work of the mine. Development work underway includes sinking a new shaft, which will be a fine one and up-to-date in every particular. Underground ventilation is good and the physical condition of the mine all over is first-rate. The daily capacity of the mine is about 600 tons.

Local superintendent, W. H. Jobe; mining captain, W. H. Bingry.

CASPIAN MINE.

This is a young mine with a very promising future outlook and gives every promise of developing into a fine property and an unusually profitable business enterprise. It made its fiscal shipment in 1903 and is located at Stambaugh, Iron County, Michigan, and situated in the northeast quarter of Section 1, Town 42, Range 34, with 160 acres of land.

Local superintendent, W. H. Jobe; mining captain, W. Culgrew.

Ore produced is a Hematite running 57 per cent iron. In 1906, the amount of ore shipped was 85,000 tons as compared with 10,000 tons sent out the previous year. The gain for the year is substantial and looks well, indicating a successful year's work. Operations are conducted with vigor

and in the best way for bringing the best results. Future requirements are anticipated and provided for in good time and everything in and about the mine runs smoothly and appears to be in the best trim. Product is taken out by the "back-stoping" method and it answers first-rate for the ore body mined. Levels are connected and ventilation is good. For a young mine, it is in a fine physical condition. The average number of men employed during 1906 was 150 and 15 power drills in operation.

Underground operations are conducted through one fine shaft, substantially timbered and in good working condition. Skips lift two tons to a trip and operate in balance, dumping automatically. Shaft is 300 feet deep and sinking. It was sunk 100 feet in 1906 and the usual amount of development work was done. Progress was substantial and results fairly satisfactory. Mine equipment is good for present requirements and in first-class order. This mine has an encouraging outlook.

VIVIAN MINE.

The Vivian mine is located at Quinnesec, Michigan, and has the west half of Section 34, Town 40, Range 30, and was organized in 1901.

James Brew, mining captain; G. D. Crippen, engineer.

The average number of men employed during 1906 was 77 and the number of power drills operated was 12. The mine produces rather low grade ore, running 40 per cent iron, and has a daily capacity of 500 tons. It is opened and operated through one large shaft, 5x14 feet in dimensions. Shaft is 210 feet deep with lateral openings extending in ore body averaging in length 1,000 feet. Skips counterbalance in shaft and work very smoothly. The "back-stoping" method is used for recovering the ore. Shaft connections are connected on different levels and levels in turn are connected by raises or winzes and form quite a network of underground openings that efficiently ventilate the workings and make them cool and airy. In a cool, airy mine, men can always do a good day's work. No reasonable expense is spared in making the mine safe and solid for working in. And this work must constantly be kept up, or the product will begin to fall off. All tramming is done by hand labor. Trams dump directly into skips which are hoisted to surface and in turn dump into ore cars and the load transferred to the stockpile. The work is readily and economically done. Operations are conducted on practical lines and the management aims to get out the best there is in the property and in the most business-like way. Results accomplished have been fairly substantial and should be, in the main, satisfactory.

Mechanical equipment is in good running order, and includes hoisting plants, an air compressor plant, pumping outfit, workshops conveniently located and supplementary appliances adequate for requirements. The ore shipments in 1906 amounted to 107,269 tons as against 110,000 tons shipped the previous year.

THE PENN IRON MINING COMPANY.

This company ranks among the prominent and well known iron ore producing organizations operating in the iron ore region of the Lake Superior district. The properties owned and operated by the corporation are located at Vulcan and Norway in the Menominee Range and have an annual capacity of from 400,000 to 500,000 tons of ore. For many years, the mines have been vigorously and successfully worked, employing a large force of men and contribute to the output of the district since the beginning of operations nearly 4,000,000 tons of ore. I visited the property some time ago and so far as the physical appearance is concerned, there was nothing in sight to indicate why it might not be kept going vigorously for many years to come and keep adding to the output of the district and developing its natural resources. The properties include the East and West Vulcan, Curry, Brier Hill, Norway and Cyclops, producing six grades of ore from special Bessemer to low-grade silicious. The workings on the West Vulcan, Curry and Brier Hill are connected forming practically one mine and the Norway and Cyclops are contigious. The reserves of ore are very large. Lands are extensive and located in Town 39, Range 29. The nature of the ore bodies mined appear to be irregular ore chutes, but persistent and lasting. In 1906, the Penn Iron Company shipped 497,350 tons of ore as compared with 424,669 tons shipped the previous year. Analysis of ore mined runs to several grades: 40 to 62 per cent iron and .010 to .150 per cent phosphorus. Operations are conducted through five shafts, well located, substantially constructed and in good running order. Shafts are connected underground and air circulates freely through the openings making the mine cool and comfortable for working in. The product is hoisted in skips carrying three tons to a trip operated both in balance and singly. Skips are lifted and lowered with great speed and dump automatically in ore cars. The deepest shaft is 1,500 feet down. Shaft sinking done during 1906 was 122 feet and 6,542 feet of drifts were driven for the purpose of opening up and developing fresh reserves of ore. Results in this line must be classed as fairly satisfactory. Development work under way includes a new shaft for the West Vulcan and Curry mines. Underground and on surface, the properties are managed with marked ability and every department appears to be going along almost to perfection. The success achieved tells the whole story. The daily capacity of the mine is about 1,400 tons. A large number of men are employed at good wages and on an average about 80 power drills are operated. Tram-cars are operated by hand labor and mule power. Method in vogue for taking out the product is caving and rooming on timber floors. Machinery is of the best; is highly efficient, practical in mechanical construction, in first class trim and economically operated. Many conveniences and privileges are provided for the employes that contribute largely in making home life at the mines comfortable and pleasant. The plant is very complete, adequate for present requirements and good for some

time to come. General office for the mines is at Vulcan, Mich. Improvements underway include a plant for generating electricity on the Menominee river and was under construction during the year. It will be in operation some time this spring or early summer. The plant will be used for operating compressors and pumps for East Vulcan, West Vulcan and Curry mines.

Officers of the company: President, Powell Stackhouse; secretary-treasurer, A. P. Robinson; general manager, William Kelly; chief clerk, Anton Johnson; mining engineer, F. A. Janson; mechanical engineer, F. H. Armstrong; general office, Philadelphia, Penn. Mining captain of East Vulcan, William Harris; Mining captain of West Vulcan, William Bond; Mining captain of Cyclops, William Williams.

LORETTO MINE.

This mine is located in Dickinson and owns 400 acres of land. General manager, J. Ward Amberg, 438 Fulton St., Chicago, Ill.; superintendent, Henry Truscott; mining captain, T. Donovan; engineer, Warren McLaughlin; chief clerk-secretary, Harold V. Hayes. Postoffice address, Loretto Mich.

About 180 men were employed during 1906 and 97,980 tons of ore produced. This mine became a producer in 1893 and produced previously to 1906, 844,884 tons of ore.

Ore body mined is a Red and Blue Hematite running 55 per cent iron and .054 per cent phosphorus. Appearance of ore body mined as regards size and quality is good and its principal vein dimensions are 1,000 feet long, 800 feet deep and 35 feet average width.

The mine is developed and operated through two shafts and sinking is underway to the 8th level. Depth of the shaft is 800 feet and skips are operated in balance and carry 1½ tons to a trip. Main shaft is 6'x14' inside and timber shaft is 7'x8' in dimensions, divided into three compartments, is substantially constructed with a daily capacity of 400 tons of ore.

The mine is opened up and developed on practical, systematical lines and economically operated. Development work underway is considered very extensive and future prospects bright. Mine ventilation is excellent, as the mine is not very deep and air circulates freely.

Air compressor has capacity to run 33 drills and tram cars are operated by hand labor. The "eight foot timber set" system is followed for taking out the ore and it works satisfactorily. About $10,000 worth of timber are consumed annually in the work, which serves to secure and hold up the ground and make mining comparatively safe and comfortable.

Equipment embraces a Direct Acting Corliss Bullock Flat Rope Hoist for main shaft; Camp & Lane hoist for timber shaft; two 200-horsepower tubular and one 250-horsepower furnace marine boilers built for high pressure; machine and blacksmith shops and saw mill well equipped with lathes, steam hammers, drill sharpeners, etc.

Additions made consist of two forties of land to the leasehold and the aforesaid "principal vein" is now being explored into said new land on the last six levels of the mine.

Improvements contemplated embraces a new steel shaft house and modern automatic skips and cable or electric trestle dump.

Caving system is contemplated and may be adopted for taking out the product on the "principal vein" on the new land secured last December.

The Sturgeon river, a small stream, runs over the old mine necessitating the use of expensive eight-foot set timbering and requiring the company to leave two-thirds of the ore there for pillars to sustain surface and river.

THE LORETTO MINE.

This property is operated by the Loretto Iron Company, which is located in Dickinson County, Mich., and owns 400 acres of land in Section 7, Town 39, Range 28. The average number of men employed was 180 and 22 power drills were operated. Principal vein dimensions, as discovered to date, are 1000 feet long, 800 feet deep, average width 35 feet. Analysis of ore now being 55 per cent iron and .054 per cent phosphorus Mine is opened up and developed through two fine shafts, 6x14 feet "inside timber" and 7x8 feet respectively. Amount of ore hoisted to a trip is 1¼ tons. Skips operate in balance and dump automatically. Shafts are 800 feet deep. 150 feet of sinking was done during 1906, about 1200 feet drifted, and crosscutted 300 feet. Total opening work for the year was 1650 feet. Altogether, 7 levels are extended from shaft and development work underway is very extensive. Product is being taken from the third, fourth, fifth, sixth, seventh and eighth levels. The product of ore in 1906 was 97,980 tons as against 100,162 tons shipped in 1905. Daily capacity of the mine is about 400 tons. Total number of tons produced previously to 1906 was 844,884. Tramcars are operated by hand labor. "Eight foot timber set" system is used for taking out the product. About $10,000 worth of timber is used in the mine work annually. Mine ventilation is excellent.

Equipment includes Direct Acting Corliss Bullock Flat Rope Hoist for main shaft; Camp & Lane hoist for timber shaft; two 200-horsepower Spect. Tubular and one 250-horsepower furnace marine boilers built for high pressure, machine, blacksmith shop and saw mill well equipped with lathes, steam hammers, drill sharpeners, etc.

Two additional forties of adjoining land were added to the leasehold and the aforesaid principal vein is now being explored into said new land on the last six levels of the mine.

New steel shaft-house and modern automatic skips and cable or electric trestle dump are among the improvements contemplated. "Caving" system is contemplated and may be adopted for taking out the product

from the "principal vein" on the new land secured last December. A small stream runs over the old mine necessitating the use of expensive "eight foot set timbering," and requiring the company to leave two-thirds of the ore there for pillars to sustain surface and river.

Air compressor has the capacity to run 35 drills, and as developments are extended, additional drills will be placed in commission. Progress has been substantial and continuous. The mine is opened up and developed on practical, systematical lines and economically operated. The ore bodies that furnish the mine product are quite large, continuous and persistent with no place looking better or more promising than the deepest points penetrated. Average length of openings in ore bodies is about 600 feet. Stoping or ore extraction is continued on different levels and the amount of ore developed in sight and available for production is sufficient for a long successful run at the present rate of producing. The property has a good outlook for the future and better things than it has yet enjoyed are predicted for it.

Mechanical equipment is powerful, fairly complete, in good running order and capable of doing the work of the mine.

General manager, J. Ward Amberg, 438 Fulton St., Chicago, Ill.; superintendent, Henry Truscott; mining captain, T. Donovan; engineer, Warren McLaughlin; chief clerk and secretary, Harold V. Hayes. Post-office address, Loretto, Michigan.

CORRIGAN, McKINNEY & COMPANY.

This company stands among the progressive mining organizations, producing iron ore in the Iron Region of the Upper Peninsula of Michigan. It is an enterprising concern with large possessions of mineral and timber lands located in different sections; is well known within mining and business circles and has a fine record with practically unlimited credit. Stockholders are men of the best and soundest type who know the business thoroughly and conduct it for the best interests of all connected with the enterprise. Lands contain immense bodies of soft ore characteristic of the district, some of which have been opened up and developed into profitable mines that form solid, substantial industries, with ample room for further expansion and employing a large number of men at good wages. The trade coming from the employes of the mines is the mainstay and principal support of the towns located all over the iron region. Mines are opened on broad, practical lines, and vigorously operated. The management aims to work them on a scale somewhat commensurate with their possibilities, and to get out the best there is in them, and the success achieved had been quite satisfactory. The machinery plant is as good as there is going for requirements. It has no frills nor tinsel, but is powerful and efficient and economically operated. Mines are ably and skillfully managed, and progress towards bigger and better things has been substantial and continuous. A large number of profits have been put back

into the property, which has strengthened its position in all branches and added to its capacity. Upon the whole, the physical condition of the company's properties never appeared to better advantage than at the present time. Order and system prevails everywhere and the business affairs of the company seem to be performed promptly and with excellent efficiency. I visited the mines of the company some time ago and found everything running smoothly and on up-to-date methods. Like practically all other mining companies located in the Upper Peninsula of Michigan, the Corrigan, McKinney & Company pay special attention to the needs and requirements of its employes and their families, and provide them with many privileges and conveniences that help much toward making social conditions in and about the mine locations enjoyable and pleasant.

The company controls and operates the following mines:

On the Gogebic Range—the Ironton, Winona and Colby. In the Crystal Falls district, Menominee Range—the Tobin, Armenia, Deen, Lamont, Fairbanks, Kimbal, also the Lincoln mine, Crystal Falls mine, Great Western mine, Quinnesec mine, besides different properties under exploration.

Main business office, Cleveland, Ohio; mine office, Crystal Falls, Mich.; president, James Corrigan; general superintendent, W. J. Richards; secretary-treasurer, J. E. Ferris; chief clerk, E. J. Oswald; engineer, Fred C. Roberts; head mining captain, W. J. Trevarthen.

TOBIN MINE.

Tobin is an interesting mine, has solid merit and according to present indications, a fine future. As age goes, it is a young concern, having made its first shipment of ore in 1901. Recent developments have been quite satisfactory and resulted in opening up some substantial stopes of ore. The company employed during 1906 an average number of 205 men and operated 15 power drills. Ore produced is a Red Hematite running 58.96 per cent metallic iron and high in phosphorus. The amount of ore shipped in 1906 was 316,838 tons including the Genesee's 80,971 tons. Daily capacity of the mine is about 900 tons ore and still better things are predicted for this property. All told, shipments of ore sent out from Tobin and Genesee foot up over a million tons. Property is located at Crystal Falls in Town 43, Range 32 with 80 acres of land. Underground operations are conducted through one fine shaft, four compartments, 7'8"x21' in dimensions and 735 feet deep. In 1906 the shaft was sunk 160 feet. 1,500 feet of levels were drifted and 2,200 feet of crosscuts were extended. Total opening work for the year, 3,860 feet. Eight levels are extended from shaft and the product comes from practically all over. Tram-cars are operated by electricity and highly appreciated by the men. Skips are operated in balance and lift three tons of ore to a trip and dump automatically in cars. Air compressor is a Rand Imperial 25-drill capacity machine.

The method in vogue for taking out the product is "Caving" system and "subbing." It works admirably. Mine is not deep and ventilation is good.

Equipment is up-to-date and includes the following: One 20x48 Twin Corliss Nordberg Hoist, first motion; one 16x20 Marinette hoist, second motion; four 125-horsepower horizontal tubular boilers; one triple expansion Prescott pump; one Jeffery electric dynamo; one green economizer and supplementary additions adequate for requirements. Additions made and improvements completed during 1906 included electrical equipment throughout, both light and power, and eleven new dwellings for employes The whole is in fine form and works to perfection.

Postoffice address, Crystal Falls, Michigan.

CRYSTAL FALLS MINE.

General superintendent, W. J. Richards; Postoffice address, Crystal Falls, Michigan; Assistant superintendents, W. H. Fraser and James D. Vivian; mining captain, W. J. Trevarthen; engineer, F. C. Roberts; chief clerk, E. J. Oswald.

The mine is located at Crystal Falls, Iron county, Mich., and situated in Town 43, Range 32, with 40 acres of land. The company employs 114 men on an average and 10 machine drills are operated. Nature of mineral body mined is a High Phosphorus Hematite running 58.66 per cent iron. There is no regular vein, but small ore pockets. The future prospects of the mine are reported not very good, which is regretted by all interested in the future of the district.

Mine is developed and operated through one shaft, three compartment, 5x16 feet in dimensions and 1,060 feet deep. Shaft sinking was done during 1906 was 130 feet and the number of feet drifted was 365. 1,000 feet of crosscuts were driven besides other developing and exploring work. The mine is developed on up-to-date principles and all things considered, the underground workings are in fine physical form. Levels are connected and ventilation is good. Everything in and about the mine appears to be in first class shape with every department running satisfactorily.

The daily capacity of the mine is 400 tons. 111,871 tons of ore were shipped during 1906. Total number of tons produced previous to 1906, 1,507,940. Air compressor is a Rand 10-drill capacity machine. Tram cars are operated by both electricity and hand labor and the method in vogue for taking out the product is "back-stoping." Mechanical equipment is efficient and includes one 24x48 single-cylinder Bullock Hoist second motion, three 300-horsepower boilers with supplementary additions adequate for requirements. The mine is skillfully managed.

GREAT WESTERN MINE.

This mine is located at Crystal Falls, situated in Town 43, Range 32, with 80 acres of land. It has the same officers and postoffice address

as Crystal Falls mine. The average number of men employed during 1906 was 383 and 15 power drills were operated. Ore body mined is a High Phosphorus and Hematite running 58 per cent metallic iron. There is no regular body, but large pockets of ore and the future prospects of the property are reported to be uncertain. These pockets, however, are likely to prove persistent and to keep turning up for some years to come. Underground operations are conducted through two shafts, three-compartment, 6x18 feet in dimensions and 908 feet deep. Skips lift three tons of ore to a trip and operate in balance. 200 feet of shaft sinking, 1,000 feet of drifting and 900 feet of crosscutting were done in 1906. Thirteen levels are extended from the shaft and development work underway consisting of drifting and opening up ground. Product is being taken from the 12th and 13th levels and ore reserves are substantial. The mine is opened up on broad practical lines and economically operated. Progress has been substantial and of the right kind for bringing results. Daily capacity of the mine is 1,000 tons. 311,218 tons of ore were shipped in 1906. Previous to 1906, the total production was 1,089,525. Tram-cars are operated both by electricity and hand labor. Method in vogue for taking out the product is "back-stoping."

Equipment is up-to-date and includes a 15-drill capacity Rand compressor; one 24x48 Twin Sullivan hoist, first motion; one 18x42 Bullock Corliss hoist, second motion; four 200-horsepower Wickes vertical water tube boilers; one Compound Prescott pump, 700 gallons; one Triple Prescott pump, 1,000 gallons; one 2,000-gallon Harris Blowing system. During 1906 the property was electrically equipped throughout, light and power, and ten new dwellings were built for employes.

I visited the property last winter and everything in and about the works appeared to be running to perfection.

DUNN MINE.

Mine location is at Mastodon, Iron County, Mich., with 40 acres of land. Has the same officers as the Crystal Falls mine. The average number of men employed during 1906 was 125 and the amount of ore shipped 91,476 tons. The ore bodies developed in this property seem to be very similar to those found in the Crystal Falls and the Great Western mines, which are irregular pockets and not well defined veins. However, I am of the opinion they will meet expectations. Underground work is caried on through one shaft three-compartment, 5x16 feet in dimensions and 834 feet deep. The amount of ore hoisted in skips to a trip is three tons, operated in balance and dump automatically. Shaft sinking done during 1906 was 200 feet, drifted, 800 feet and crosscutted 650 feet. Total opening and development work for the year, 1,650 feet. Five levels are extended from shaft. The mine is opened and worked on the best methods going for bringing the most satisfactory results. All openings are in good condition and developed with a view to getting out the product of

ore economically and for the best interest of the company and the future well-being of the property. Dunn is practically a new mine and in fine physical shape. Daily capacity of the mine is about 400 tons of ore. Total number of tons of ore produced previous to 1906, 1,086,178. The average number of power drills operated is 10 and a ten-drill capacity air compressor is used for running the drills. Tram-cars are operated by hand labor. The method in vogue for taking out the product is "back stoping" and it is well adapted to the ore bodies developed in this mine. Workings are not deep and ventilation is good.

Mechanical equipment includes one 20x48 Twin Corliss Sullivan Hoist "first motion"; three 150-horsepower horizontal tubular boilers; one Compound Prescott pump, 500 gallons. The plant is in good running order and doing first-rate service. It is adequate for requirements.

Additions made during 1906 includes an engine for hoisting, with three boilers.

LAMONT MINE.

Mine location is near the town of Crystal Falls in Town 40, Range 32 and leased 40 acres of land. Its product of ore for 1906 was 89,980 tons as against 75,000 tons shipped the previous season, which includes the product of the Paint River also. This mine is now producing only ore left in pillars and forms a backstope proposition. Considerable development work is underway and unless something is found, the mine will be worked out very shortly. Underground operations are conducted through one substantial shaft, 6x18 feet in dimensions, and three-compartment. The mine is 958 feet deep, having been sunk 100 feet deeper during 1906. The average number of men employed was 78 and six machine drills were operated. Ore body mined is a High Phosphorus and Hematite running 58 per cent iron. Skips hoist 2½ tons to a trip, which are operated in balance and dump automatically in ore cars. Shaft sinking done during 1906 was 100 feet; drifting for development purposes, 450 feet and crosscutting 60 feet. Total opening work, 610 feet. Altogether, 13 levels are extended from shaft, and as regards workings, the mine is in fine physical condition. It is skilfully managed and economically worked. Daily capacity of the mine is about 250 tons. Total number of tons of ore produced previous to 1906 was 423,271. As to the future prospects, the property is reported to be almost played out. This is to be regretted and it is hoped new ore bodies will be found as developments are continued. Tram cars are operated by hand labor and the method in vogue for taking out the product is "back-stoping."

Mechanical equipment is in good running order and doing full duty. It embraces a 10-drill capacity air compressor, one 20x42 Single Bullock hoist, "second motion"; three boilers 250-horsepower; one Compound Prescott pump, 500 gallons, besides supplementary fittings and appliances adequate for doing the mine work.

ARMENIA MINE.

Armenia is quite an old mine, having made its first shipments in 1889. During a number of years, however, it was idle and produced no ore in 1905. The ore produced is low grade, about 52 per cent iron, and high grade in silica. The mine has just been unwatered and is now getting in shape to take out the ore. It is credited with having produced previous to 1906, 247,061 tons of ore. Sixty-six men are now employed and six machine drills are operated. Operations are conducted through one shaft 5x16 feet in dimensions and three-compartment. It is 465 feet deep with development work continuing in four levels extended about 150 feet in length. The work of unwatering was conducted with much energy and substantial progress made from start to finish. Work underway is practical and planned for bringing the best results. The management has discovered at considerable depth, a body of ore that proves the mine a good one. The present operations are carried on with a view of developing a new level so as to get a better idea of the extent of the ore deposit before locating a new shaft and equipping the property with a new plant of machinery. The present shaft and machinery are located too close to the ore body. A fine location has been built up and the mine has taken on an air of permanency that was never apparent there before. Ore is hoisted in a cage carrying 1¼ tons to a trip. Shaft sinking done during 1906, 480 feet, drifted, 370 feet, and crosscutted, 425 feet. Total opening work was 1,275 feet. The daily capacity of the mine is about 200 tons. The amount of ore shipped in 1906 was 27,882 tons. Tram cars are operated by hand labor and the amount of timber used in the mine work annually costs about $2,000. Ventilation is considered good.

Mechanical equipment embraces a 10-drill capacity Rand air compressor, one 18x36 Webster, Camp & Lane hoist, three boilers, 300 horsepower, one Compound Prescott pump with capacity for 1,500 gallons, besides the necessary machinery and work shops for doing up-to-date mine work.

Additions and improvements completed and also underway are as follows: 10 new dwelling houses completed and 10 under construction.

The property is in capable hands and splendidly managed. Everything runs nicely.

KIMBALL MINE.

This is an exploratory proposition located at Crystal Falls in Town 43 North, Range 32 West, with 40 acres of land. Forty men were employed on an average during 1906 and substantial progress was made Work is conducted with a portable plant at the present time, which will likely be replaced with a permanent one as soon as requirements demand the change. Property will be thoroughly explored and developed on methods for bringing the best results. The official force in charge of the

Corrigan, McKinney & Company's property are directing operations at these new propositions.

FAIRBANKS MINE

This is also an exploratory proposition and in 1906 employed on an average 43 men. The property is located at Crystal Falls in Town 43 North, Range 32 West, with 40 acres of land. P. O. address, Crystal Falls, Mich. Shaft sinking done during 1906 was 200 feet, drifting 800 feet, crosscutting 600 feet and the total opening work was 1,600 feet.

BAKER MINE

Baker is also an exploratory proposition and employed during 1906 40 men. Property is situated in Town 43 North, Range 34 West. Real estate consists of 40 acres. Work is conducted on practical lines and good headway is being made.

SAGINAW MINING COMPANY

This company is doing exploratory and development work, and has a lease on the S. W. quarter of Section 4, Town 39, Range 29, Dickinson county, Michigan.

Development and exploratory work is conducted through one shaft, 5x9 feet in dimensions and divided into skip and ladderway. Shaft is 240 feet deep and has three levels. The work is conducted on systematic, practical lines and indications are favorable for developing a substantial property. Ore shipped during 1906 was 21,017 tons. It runs about 52 per cent iron and .020 per cent phosphorus. Ore is recovered on the caving system and it works well. About 30 men are employed, and 4 power drills operated. Good progress is being made. The company is enterprising and deserves to be rewarded. A promising ore body of the Bessemer grade has been located in the property with a diamond drill and it has been planned to run the hole down to a depth of 1,000 feet. It is now down over 400 feet. George A. Baird of Chicago is president and treasurer. E. W. Jones of Norway, Michigan, is secretary and general manager. Thomas W. Wills is mining captain. Post office address, Norway, Mich.,

BRISTOL MINE

General manager, E. W. Hopkins, Commonwealth, Wis.; superintendent, Arvid Bjork, Crystal Falls, Mich.; head mining captain, Emil Carlson; chief clerk, Fred H. Miller. Post office address, Crystal Falls, Mich.

At this mine there is a big open pit. The company has been adding to the stripping area along the east and north sides of the pit. The ore is being milled down to the fourth level and the method of mining is thus inexpensive.

This mine is operated by the Oglebay, Norton & Co., and controls 120 acres of land in Town 43, Range 32 located in Iron county, Mich. The average number of men employed during 1906 was 215 and the output of ore produced 300,000 tons as compared with 214,000 tons produced in 1905. The ore body mined is lumpy red Hematite running 50 to 56 per cent iron. One shaft 6x16 feet in dimensions 750 feet deep is operated. Amount of ore hoisted in skips to a trip is 1¾ tons to a trip operating in balance. The shaft was sunk 85 feet during the year 1906. Average length of openings in ore body is 300 feet with 6 levels in all extended. Product is being taken out from four levels. Daily capacity of the mine is about 1,000 tons and total number tons of ore produced previously to 1906 was 958,147. The future prospects for the property is all that could be desired and it is ably and skillfully managed. Average number of power drills operated are 17. Tram cars are operated by hand labor. The "underhand sloping" system is used for taking out the product and it answers to perfection for the work. Mine ventilation is good and its physical condition first rate. Surface equipment is in good running order and doing first class duty. The mine is economically operated and in a prosperous condition. Improvements underway include a new hoisting plant, first motion, to carry 6 tons ore to a trip; new compressor; 10 new dwellings; new change house. With these additions completed and in commission, the mine's equipment will be adequate for requirements for some time to come.

MILLIE MINE.

The Dessau Mining Company is opening up and developing the Millie mine, which is an open cut proposition. Real estate holdings of the company consist of 70 acres of land situated in Town 40 North, Range 30 West and located in Iron Mountain, Dickinson County, Mich.

General manager, Silas J. McGregor. Postoffice address, Iron Mountain, Mich.

Forty men were employed during 1906 and 36,815 tons of ore produced. Previous to 1906, 298,550 tons of ore was produced. The ore body mined is a Hard Hematite running about 40 per cent metallic iron. Property has a promising future outlook and promises to develop into a substantial mine. There was about 180 feet of drifting done during 1906 and 50 feet crosscutted. Development work underway includes sinking shaft and supplementary work to take out the product on an economical and up-to-date method. Five power drills are operated with an eight-drill capacity compressor installed. Tram cars are operated by hand labor.

and the method in vogue for taking out product is "Open Cut" which happens to be the most economical way for recovering the ore.

The property is skillfully managed and economically operated. Everything connected with the works appears to be running smoothly and successfully.

The mine was formerly worked as an underground mine producing a high grade hematite ore known as Millie, but for the past few years, the underground workings have been abandoned and the mine product was taken from an open cut. A shaft is now being sunk to reopen the underground workings.

BEAUFORT MINE.

General manager, G. L. Woodworth; Postoffice address, Michigamme, Mich.

This company is operated by the Niagara Iron Mining company and has abandoned to the fee owners their lease of the Beaufort mine and it made no product in 1906. The company, however, has under lease two properties in the same vicinity, one of which they propose to call the "Ohio" mine and the other the "Portland" mine. Neither of these was in operation during 1906.

HIAWATHA MINE.

This mine, located near Sheridan, has been out of business since May, 1904. The Buffalo & Susquehanna company, which has an option on the Hiawatha mine, has sunk the shaft another level and is engaged in drifting, the result of which will probably determine the future of the property, or at least whether a permanent lease will be taken by the present option holder. This mine has been in the hands of several concerns, among them the Victor Schlitz Mining Company of Milwaukee, which is still interested and was last operated by the Thomas Furnace Company. The mine was a fairly good proposition in years gone by, although it produced a non-Bessemer ore, found in small irregular lenses and the indications for its future development are encouraging. About 20 tons of ore was produced during 1906.

HEMLOCK MINE.

The Hemlock River Mining Company operates this mine located at Amasa, Iron County, Mich. Postoffice address, Amasa, Mich. General manager, Chas. H. Munger, Duluth, Minn. General superintendent, Chas. F. Lawrence, Iron Mountain, Mich.

Real estate holdings consist of 320 acres of land situated in Town 44, Range 33. The average number of men employed during 1906 was 157 and 20 power drills were operated on an average. The ore mined is a

non-Bessemer, running about 52 per cent iron. The mine became a producer in 1891 and since the beginning of operations has produced a total of 1,285,714 tons of ore. The amount of ore shipped in 1906 was 109,378 tons as compared with 125,000 tons shipped the previous year. The mine is opened on broad, practical lines, and results accomplished show that it is economically operated. The management aims to work it on a scale somewhat commensurate with its scope and to get out the best there is in it. Progress has been substantial and continuous. The mine is in a prosperous condition and it is opened and developed by means of one fine shaft, 7x15 feet in dimensions, 850 feet deep, with a capacity for lifting 500 tons of ore daily. The ore bodies furnishing the product look well, are large and continuous and are reached by various levels which being connected, make free circulation of air and the underground openings are fairly comfortable for the miners working there. Average length of openings in ore bodies is about 1,800 feet, and there is an abundance of ore reserves in the mine to draw upon in regular order of production. Future requirements must be anticipated and provided for or the cost sheet will soon show that something is wrong. Powerhouses are substantial, well located for direct service and filled with the best kind of machinery for doing mine work. The "back-stoping" method is used for taking out the product, which answers first-rate for the ore body mined. Mechanical equipment is in good running order and adequate for general requirements. It embraces a Rand & Allis compressor, hoisting engines, and supplementary additions usually employed for progressive mining. Everything appears in first-rate trim and the property has a wholesome and prosperous appearance.

CALUMET IRON MINE.

General manager, C. H. Munger, Duluth, Minn.; superintendent, Chas. E. Lawrence. Postoffice address, Felch, Mich.

This property is operated by the Calumet Ore Company located in Breen township, Dickinson county, with 240 acres of land situated in Town 41, Range 23.

Calumet iron mine is a young proposition with a promising outlook and the management hopes to develop it into a substantial producer and a profitable business enterprise. It is opened up and developed on modern lines and in the best way for bringing the most satisfactory results. Everything considered, progress has been satisfactory and of the kind that counts for the future as well as for the present time. The management aims to get out the best there is in the property and it is well managed. In 1906, the amount of ore shipped was 17,008 tons. Previous to 1906, the total amount of ore produced was 38,713 tons. The ore mined is a Hematite running about 40 per cent metallic iron, which is rather low grade. During 1906, the mine employed on an average 47 men and the property is opened by three shafts. The daily capacity of the mine is

about 150 tons. The method in vogue for taking out the product is "back-stoping", and the ore is trammed by hand labor. Mine ventilation is good. Mechanical equipment is practically new, in good running order and adequate for requirements.

MUNRO MINE.

This mine is a substantial property operated by the Munro Iron Mining Company. General manager, G. L. Woodworth, Hibbing, Minn.; superintendent, H. McDermott, Norway, Mich.; engineer, Geo. R. Paul; chief clerk, H. N. Truckey; mining captain, H. McDermott. Postoffice address, Norway, Mich.

About 50 men were employed during 1906 and 47,453 tons of ore produced. Previous to 1906 there was 123,270 tons of ore produced. Nature of the ore body mined is hard low grade iron ore running about 36 per cent metallic iron. One shaft is in operation, which is 14x6 feet inside timbers, two skiproads and one ladderway. Skips are operated in balance and carry 1¾ tons to a trip. Shaft is about 90 feet deep and about 100 feet of ground was drifted in 1906, and 45 feet crosscutted. Development work underway includes drifting and raising. Daily capacity of mine is about 400 tons in 10 hours. As far as quantity of ore goes, the future prospects of the property looks first rate. Ten drills are operated with one 12-drill Norwalk compressor and one 10-drill Sullivan compressor in operation. Tram cars are operated by hand labor. The "milling" process is used for taking out the product and the amount of timber used in the mine annually, about 20,000 feet. There is good ventilation in this mine from the raises to the surface. Mechanical equipment is in good running order. It includes one double hoist 12x14 inches, drums, 54 inches diameter; one Sullivan Compound straight line compressor 20x20 and 13x20; one Norwalk air compressor, 22x24 and 22x14½; one No. 6½ Gates crusher; one 12x16 slide valve engine for same; one No. 10 Cameron pump; one No. 5 Cameron pump; one No. 6 Knowles pump; two 20"x16' boilers; two 2-ton steel self dumping skips.

Additions made and improvements completed during 1906 consist of taking out No. 6 Gates crusher and replacing with No. 7½ Austin crusher, and one 14x28 Buckeye engine to drive crusher.

Considerable stripping will have to be done from time to time to furnish room for breaking down the product of ore. The property is in capable hands and is efficiently and economically operated. Everything appears in a thriving and prosperous condition.

HOLLISTER MINE.

Frank Scadden, superintendent; Robert Phillips, mining captain; William Staples, engineer. Postoffice address, Crystal Falls, Mich.

Hollister mine is opened by M. A. Hanna Company. Realty holdings consist of 80 acres of land situated in Town 43 North, Range 32 West, near Crystal Falls.

The average number of men employed during 1906 was 22 and no product was made. 4,800 tons of ore was produced previous to 1906. The ore body under development, as far as is known, is about from 8 to 12 feet in width. Operations are conducted through one shaft 7x9 feet in dimensions and 150 feet deep. The main work accomplished during 1906 was pumping out the mine. Three levels are extended and development work underway includes two drifts and one shaft. The mine has steam and hoisting capacity for about 500 tons and two power drills are operated.

Two 100-horsepower horizontal boilers, one 6-foot Webster Camp & Lane hoist, one 8-drill compressor and one cage are included in the equipment. Everything was made in 1906 and is new and up-to-date. The property is in good hands and progress has been substantial. Operations are conducted on practical lines and for the best interests of the company.

Future prospects for this property are considered very good.

GOGEBIC COUNTY MINES.

GOGEBIC RANGE.

On the Gogebic Range, the Oliver Mining Company controls and operates the following mines: Aurora, Norrie, Tilden, Davies, Chicago, Geneva and Puritan.

O. C. Davidson, general superintendent of mines; D. E. Sutherland Superintendent; chief clerk, F. J. Sullivan.

AURORA MINE.

Aurora forms one of the solid, substantial mining enterprises of the iron region and is well and widely known. It is a substantial producer and one of the chief supports of the town of Ironwood. The mine location is situated just east of the town in Section 23 with 240 acres of land. Mine has been in successful operation for about 16 years and is credited with having produced since the commencement of operations about 2,714,016 tons of ore. The ore bodies developed are large and continuous and looks good for years ahead at the present rate of production. The product for 1906 was 411,430 tons of ore, as compared with 482,551 tons reported for the previous year. Ore runs 61.50 per cent iron and .038 per cent phosphorus and 5.50 per cent silica. The mine is developed and operated through two fine working shafts, "A" and No. 1. "A" shaft is 7'6"x18' in dimensions, three-compartment and 1,021 feet deep. No. 1 is 5'10"x14' in dimensions and 1,155 feet deep. 425 men are employed and five power drills are in operation. No reasonable expense is spared to make the working departments safe and comfortable for men and something over 1,000,000 feet of timber, board measure are consumed annually for holding up the ground and in doing mine work. Every department is in fine physical condition and doing good duty. Underground workings are developed in the best up-to-date methods and well managed. Shafts are going down and the usual number of drifts are going ahead developing additional new ground in accordance with the policy of the management. Future requirements are anticipated and provided for. This matter is kept well in the foreground. Levels are connected by various openings, well secured and air circulates freely through practically every part of the underground department. Different methods are used for taking out the products of ore. Conditions are not always the same and the method best adapted for each situation is used. Skips counterbalance in shafts, dump automatically and carry four tons to a trip. Everything runs practically to perfection. Order prevails everywhere and affairs of the mine seemed to be dispatched with care and precision. Mechanical equipments are of the

best for requirements, highly efficient, in good running order and economically operated. Workshops are conveniently located, equipped with the best tools and fittings and can turn out nearly every kind of work required in a modern mine. Mine is in a prosperous condition, with officers and men alike well satisfied with the existing conditions. Tramming is done by electricity and the system is highly appreciated by the men. Trams dump directly into skips, which are hoisted to surface and dump in ore cars in turn and the load transferred to the stockpile. The work is economically done. Results accomplished have been substantial and satisfactory. Mechanical equipment is in good running order and includes hoisting plants. A C. C. Cooper Duplex Corliss 50-drill capacity air compressor plant, pumping outfit, workshops conveniently located and supplementary appliances adequate for requirements.

William Thomas, mining captain.

NORRIE MINES.

This group forms one of the best known and most successful iron ore producing properties in the state and is credited with having shipped more ore in a single season than any mine in the whole iron region of Michigan. Its banner year was 1902 when the output amounted to 1,080,032 tons. The property has an excellent record, and produced since the beginning of operations millions of tons of high grade ore, and is good for millions more. It forms a splendid business enterprise and one of the chief supports of the town of Ironwood. Norrie mines embrace: Norrie, East Norrie and Pabst, and lie in Sections 22 and 23, Town 47, Range 46, with mine buildings forming a part of the town of Ironwood. Real estate holdings consist of 320 acres of land. Average number of men employed during 1906 was 1,000 and 40 power drills were kept in operation. Product of ore in 1906 was 784,115 tons as compared with 802,136 tons reported for the previous year. Ore analysis: Iron, 62.75 per cent; phosphorus, .040 per cent; silica, 4.00 per cent.

Underground operations are conducted through six shafts: Norrie A and B shafts; East Norrie C and D shafts and Pabst C and G. shafts. Norrie A shaft is 6x22'10" in dimensions and 1,483 feet deep, B shaft is 5x10'4" in dimensions and 1,550 feet deep; C. shaft East Norrie is 8x22' and 850 feet deep; D shaft is 10x18'8" in dimensions and 1,110 feet deep; Pabst C. shaft is 6x16' in dimensions and 1,160 feet deep; G shaft is 10x18'8" and 982 feet deep.

Air for operating machine drills, etc., for these mines is furnished by the Aurora mine compressor. The mines are substantially constructed, in good running order and capable of caring for an enormous output. Shafts generally are sunk in the footwall side and ore bodies reached by a series of crosscuts. Underground openings are developed on up-to-date practical methods, and the product is taken out in the best way for bringing the best results, no matter whether the method be caving, stop-

ing, slicing or any other. Shafts are connected on different levels, and the levels in turn are connected in various places that ventilate the workings and keep them airy, cool and comparatively comfortable for doing all underground work. Underground openings form a regular network with drifts going forward, opening up new ground that may be drawn upon whenever needed. Future requirements are anticipated and provided for well in advance. No expense is spared to make every quarter safe and nearly 3,000,000 feet of timber, board measure, is consumed annually for mining purposes. The mines are in first class condition, order and system prevailing in every department. Skips counterbalance in shafts, carry five tons to a trip and dump automatically in cars. Management aims to get out the best there is in the property and substantial success has been achieved. Mechanical equipment is of the best. It is powerful, highly efficient and arranged for haulage of a large product with dispatch and economically. The mine buildings are substantial; hoisting engines, air compressor, etc., are permanent, in good running order, practically complete and adequate for requirements. Tramming is done by an electric haulage system. Trams dump directly into skips, which are hoisted to surface and in turn dump in ore cars and the load transferred to the stockpile. The work is readily and economically done. Results accomplished have been substantial.

TILDEN MINE.

Tilden is a solid mine with distinct merit, a profitable business enterprise, and has been a substantial producer for a dozen years. It is credited by the "Iron Trade Review" with having produced since the commencement of operations, a total output of 4,510,449 tons of ore. The mine location is situated at Bessemer in Section 15, Town 47 North, Range 46 West, with real estate holdings of 320 acres. Its product in 1906 was 183,447 tons of ore as against 207,252 tons shipped during 1905. Ore mined is a Hematite. Analysis: 62 per cent iron, .050 per cent phosphorus and .5 per cent silica. Mine employs 380 men and operates 18 power drills. Underground work is conducted through three shafts: Nos. 6, 9 and 10. Nos. 6 and 9 are 7'6"x18'3" and 1,345 and 670 feet deep respectively. No. 10 is 9x16'6" in dimensions and 775 feet deep.

Shafts are connected in different levels and underground openings are developed on modern lines of mining. Openings are connected practically all through the workings and air circulates freely through them and they are comfortable for working in. No effort is spared to render the mine safe everywhere and something over 900,000 feet of timber, board measure, are consumed annually in the mine work. Developments are conducted vigorously and in the best manner for bringing the best results. Shafts are going down and the usual number of drifts are going ahead in different directions from shafts, developing fresh reserves in accordance with the policy of the management. Product is recovered from various

openings, located practically all over the mine, and taken out in the most modern way. Mine is opened up well ahead and in good physical condition. Mine equipments are adequate for requirements and in good running order. People in charge of the property know the mining business and do it right and conduct operations with a view to taking out its values to the best advantage. Ore bodies are substantial and good for some time to come at the present rate of production. Skips dump automatically in cars, counter-balance in shafts and carry from two to four tons to a trip. Mine buildings are substantial and well located for direct service. Machinery is modern, in first class running order and generally adequate for requirements. Mine appears to be in a satisfactory condition and looks thrifty. Tramming is done by mules. Trams dump directly into skips, which are hoisted to surface and in turn dump in ore cars and the load transferred to the stockpile. The work is readily and economically done. Results accomplished have been fairly substantial and should be, in the main, satisfactory. Mechanical equipment is in good running order, and includes hoisting plants, an Allis Chalmers 20-drill capacity air compressor plant, pumping outfit, workshops conveniently located and supplementary appliances adequate for requirements.

W. H. Knight, mining captain.

GENEVA EXPLORATION.

Is a development exploration property located in Section 18, between Ironwood and Bessemer, Town 47, Range 46, with 160 acres of leased land. The organization was formed in September, 1902. Mine has produced previous to 1905, 2,904 tons of ore, but made no product in 1905 and 1906. The property is being developed through one shaft 1,815 feet deep. About 40 men are employed and three power drills are operated. Its future outlook is considered decidedly encouraging. Equipment is adequate for requirements. Mine will be put in the best condition for bringing satisfactory results.

James Stanlake, mining captain.

PURITAN EXPLORATION.

Is located between Ironwood and Bessemer in Section 17, Town 47, Range 46, and consists of 160 acres leased land. Property is being developed on modern lines and employs about 40 men. Four machine drills are operated and the mine is opened by the means of one shaft 854 feet deep. Outlook for the property is considered first-rate and some people think it holds important values. Mine made no product in 1905-6. Surface equipment is good for present requirements and embraces a hoisting plant, 10-drill capacity air compressor and supplementary additions.

James Stanlake, mining captain.

DAVIES EXPLORATION.

This property is located between Bessemer and Ironwood in Town 47, Range 46, and consists of 80 acres of land. It is as the title indicates, an exploring proposition with one shaft sinking. About 40 men are employed. Prospects for striking a deposit of ore at an approximate depth of 1,000 feet are considered distinctly favorable. Work is conducted in the most practical manner and progress continues at a satisfactory rate.

The company is engaged in sinking what will be known as one of the deepest shafts ever put down on the range and one of the most substantial as well. The shaft is now 464 feet deep and will contain four full sized working compartments, will be 8x24 feet inside of timbers, and will be steel lined, similar to the big "B" shaft at the giant Norrie. The last year has added largely to the horizon of the Gogebic Range's future, and it is confidently expected that many of the difficulties encountered in the more superficial formations will not be met at depth of 2,000 feet, where the ore bodies seem to widen out and be freer from intercepting dykes. However, the grade of ore for which the Gogebic has been so famed is somewhat less fine in quality, though in a number of instances, it is expected that deeper exploration will bring a return to former grades of product.

James Stanlake, mining captain.

CHICAGO MINE.

This mine was idle during 1906.

ASHLAND MINE.

This mine is owned and operated by the Cleveland-Cliffs Company and located within the corporate limits of the town of Ironwood, Gogebic county, and has 110 acres of land in Section 27, Town 47, Range 47. H. F. Ellard, superintendent. Postoffice address, Ironwood, Mich. S. and J. Perkins, mining captains; Max H. Barber, engineer; William H. Moore, chief clerk.

The Ashland is one of the best known mines in the Gogebic Range and has a good record. It produces a Soft Hematite, running 60 per cent iron and .045 per cent phosphorus . Its product for 1906 was 338,158 tons of ore. Property was opened up in 1884 and since the beginning of operations is credited with producing a total output, including 1906 output, of 4,503,757 tons of ore. There are 316 names on the pay roll. Mine is opened up and developed on broad, practical lines, and economically operated. From time to time, big sums of money have been spent on the property that resulted in strengthening its position and adding to its producing capacity. Mining operations are conducted through two shafts, 8x10 feet and 12x18 feet in dimensions. These shafts are 834 and 1,229

feet in depth and 314 feet of sinking was done during 1906. Twelve power drills are operated and the daily capacity is about 1,000 tons. Shafts and levels are connected and ventilation is naturally good. Hand and horse labor are used for underground tramming. "Caving, rooming drifting and slice caving" are used for taking out the ore. About 400,000 feet board measure, is consumed annually in holding up and supporting the ground, and no reasonable expense is spared to make the workings safe and comfortable for miners and all connected with the work. Sinking shafts and driving levels are continued and large blocks of ground are systematically developed and put in condition for economical extraction. Mechanical equipment is actuated by steam. It is powerful and efficient, embracing hoisting, air compressor and boiler plants, all in good running order. It is adequate for present requirements. A large solid brick and cement "dryhouse" was built in 1905 to furnish comfortable quarters for underground employes. It is provided with a system of shower baths and expanded metal lockers, which are very much appreciated by the men.

Underground and on surface, the property is in first class condition and good for a long successful run.

NEWPORT MINING COMPANY

J. R. Thompson, general manager; postoffice address, Ironwood Mich.

This company operates the Newport and Anvil mines in Gogebic county. Newport owns 80 acres of land located about one mile northeast of Ironwood, in Section 24, Town 47 North and Range 47 West.

Since the beginning of operations, it has produced 3,156,054 tons of ore, which proves that this mine has been a substantial producer. 517,063 tons of ore was produced during 1906 as compared with 359,222 tons for the 1905 product.

About 700 men are employed and the mine is vigorously operated on the best practical lines and in the most economical way. Management aims to get out practically all the values in the property and in the most business-like way. I visited the mine some time ago and was very much impressed with the appearance of the property and the forceful, substantial way in which operations are conducted.

At this mine a new steel framed shaft is being sunk as rapidly as possible with a view to good work and economy. The newer finds of excellent ore at depths of about 2,000 feet in the east end of this mine have been known for a long time, and this shaft is being sunk to develop them for extensive mining. It is 28 by 8.5 feet and contains five compartments, four skipways and a pipeway. From the collar down to and into the solid rock, the shaft will be lined with concrete and made especially permanent. It is not expected that much ore will be lifted through the shaft, if any, before early in 1909.

Mr. Thompson is an expert geologist and discoveries made in Newport mine means much for the Gogebic range indicating that the mines of this district do not pinch out at such depth as have yet been reached in the deepest points penetrated. As a result of the new information deeper shafts are planned for many mines, and there will be the utmost activity in the deeper level developments all along the range for a long time to come. Ferdinand Schlesinger is at the head of the operating company.

At the east end of the property, known as the Bonnie, a small chimney of ore was followed down from the surface to the 14th level. The size of this ore body was small, turning out some 35,000 to 40,000 tons of ore per 100 feet in depth, but the ore was followed with the hope that at some point the chimney would encounter a dyke and spread out into a body of considerable size along the dyke. This occurred at the 14th and 15th levels, the shaft cutting the dyke at the 15th level. The ore lying upon the dyke, in the usual manner of Gogebic ore bodies, is of no great cross section, but has been followed for about 2,000 feet and at the present time they are mining on both the 14th and 15th levels and the shaft has been extended to the 17th level. The work of opening the 16th and 17th levels has been commenced.

The Bonnie or "K" shaft was originally a single compartment shaft, but below the 9th level, it was sunk as a two-compartment shaft. During the period the mine was idle in 1904, the portion of the shaft above the 9th level was stripped out to make a double compartment shaft, for its whole length, so that the shaft is now being operated with two skip roads hoisting in balance. The hoisting plant at this point is somewhat unusual. Two 20x42 Corliss engines are directly connected to two parallel drums six feet in diameter and eleven feet long. Both drums are loose on the shaft and are operated by friction clutches and brake bands so that the two drums can be clamped together at any point and operated in balance. The unusual feature of the plant is that the two drum shafts are parallel and are connected together by side rods similar to the operation of driving wheels of a locomotive. The capacity of the plant is a five-ton net load hoisted in balance from a depth of 2,500 feet at a speed of 2,200 feet per minute.

At the west end of the property a new hoisting plant was found necessary and drum eight feet by twelve feet wide was installed, driven by two simple 24x48 Corliss engines. This engine was designed to hoist an unbalanced load of five tons at a speed of 3,000 feet per minute in a single compartment shaft. It was so designed, however, that another parallel drum can be added, making the plant similar to the one at "K" shaft. The plant was ordered April 1st from the Thompson-Greer Company of Chicago, and on the 10th day of July commenced to hoist ore and is now hoisting from 1,200 to 1,300 tons per day from a depth of 2,000 feet besides handling all the men and supplies, as well as the ore, over a single skip road.

Tram-cars are operated by electricity and 15 power drills are operated. The mine is in a prosperous condition, skillfully managed and economically operated.

Mining captain, John Clemens; engineer, Frank Blackwell; chief clerk, R. V. Brewer.

ANVIL MINE.

The Anvil mine is located in the northeast corner of Section 4, Town 47, Range 45, and about one mile southeast of Bessemer, Gogebic County. Postoffice address, Ironwood, Michigan. J. R. Thompson, general manager.

One hundred men are employed on an average and the mine is developed on up-to-date methods. Order and system prevails all over and the property is economically operated. Product is taken out in the best way adapted for the ore body mined and underground openings are in good physical condition. The product of ore in 1906 was 63,000 tons. Total number of tons produced previous to 1906, 589,110. Forty acres of land is owned by the company and one shaft, 6x14 feet is in operation. Skips balance and carry two tons to a trip. Daily capacity of the mine is about 140 tons. 175 feet of sinking, 1,800 feet of drifting and 400 feet of crosscut was done in 1906.

Shafts are substantial, in good running order and connected at various points enabling men to pass from place to place when desired or in case of emergency. Air circulates freely through the workings and they are cool and comparatively comfortable, as mining goes, for working in. The management is progressive and everything in and about the property appears to be running smoothly and successfully. Mine buildings and power houses are well located.

William Rowe, mining captain; Frank Blackwell, engineer; R. V. Brewer, chief clerk.

IRONTON MINE.

The Ironton mine is operated by the Corrigan, McKinney Company. G. S. Barber, superintendent; head mining captain, George Buzzo; engineer, H. Dietz; chief clerk, A. R. Kohlmetz. Postoffice address, Bessemer.

This mine controls 320 acres of land situated in Town 47, Range 46, and located in Bessemer Township, Gogebic county, Mich. Ironton is a comparatively young mine with a promising future. Thus far, it has been a decided success. The property is owned and controlled by people who know the business and do it right. The average number of men employed during 1906 was 256 and 12 power drills were operated. The ore body mined is Soft Hematite forming a deposit lying on the footwall about 300 feet long. Analysis of ore mined: Iron, 60 per cent; phosphorus, .050 per cent. Mine is operated through two active shafts, 5x16 feet and

6x10 feet inside measurement. Product is hoisted three tons and one ton to a trip and skips operated in balance and singly. No. 3 shaft is 960 feet deep and No. 4 shaft is 860 feet deep. The number of feet drifted during 1906 was 3,820 and the number of freet crosscutted, 1,203 feet Average length of openings in ore body is 315 feet and all told, 13 levels are extended from shafts. Development work underway includes sinking No. 4 shaft and crosscutting in rock in hanging. Product is being taken from 8th to 12th levels. Levels are connected underground and ventilation is good. Daily capacity of the mine is about 800 tons. 112,391 tons of ore was produced in 1906 as against 39,107 tons in 1905. Previous to 1906, there was a total production of 181,333 tons of ore. Tram-cars are operated by electricity and highly appreciated by the men. Management is capable and aims to get out of the property the best there may be in it and in the most practical and successful way. The mine is opened on up-to-date methods and operations are conducted economically. The "subbing" method is used for taking out the ore, and in doing the work of the mine, about 500 pieces of 10-inch timber are consumed annually. Underground developments and mechanical construction have been continuous for some time and the property is surely broadening out for an increased output and improved results. The mine plant is actuated by steam power and the equipment includes a five-foot two-drum hoist, a twelve-drill capacity air compressor, and the usual auxiliary machinery and well equipped shops for doing the work of a well appointed mine. In the way of betterment work, the management is having installed a battery of five boilers and a foundation for a Sullivan 20x48 direct acting two-drum hoist has been finished. The engine and boiler houses are completed. There is being built for the mine one 75 Kilowatt generator and a 14x14 McEwen engine and a four-ton electric locomotive to be used in an underground electric haulage system. No. 4 shaft is being stripped down and enlarged for two skip ways to admit two skips working in balance. It is now a single skip way shaft. Improvements made in 1906 are as follows: First motion hoist, and generator, new shaft at No. 4 and 22 company dwellings.

The property is ably managed and in a prosperous condition. Everything appears in good physical condition and running successfully.

COLBY MINE.

The Colby Iron Mining Company is operated by the Corrigan, McKinney & Co., of Cleveland, Ohio. Postoffice address, Bessemer, Mich.; superintendent, G. S. Barber; head mining captain, William Crowgey; engineer, H. Dietz; chief clerk, A. R. Kohlmetz.

The Colby is a fine mine with a good record. 217 men were employed during 1906 and five power drills are operated. Previous to 1906 there was 242,318 tons of ore produced. 1906 production was 111,767 tons. Daily capacity of the mine is 400 tons. Ore body mined is a Soft Hema-

tite, which runs 62 per cent iron and from .045 to .060 per cent phosphorus. Appearance of the ore body as regards size and quality is that of a thin deposit lying on footwall, average width five feet, and length 800 feet. One shaft is in operation, 5x14 feet inside measurements. Product is hoisted in skips two tons to a trip and operated singly. Total amount of opening work done in 1906, 1,558 feet. Length of openings in ore body is 800 feet. Twelve levels are extended and development work underway includes sinking a second shaft. A 25-drill capacity air compressor is in operation and tram-cars are operated by mule power. "Back stoping" system is used for taking out the product and it is just the thing for recovering such a deposit. About 200,000 feet of timber are consumed annually in the mine work. The employes are provided with many privileges and advantages by the management that help to make their home life comfortable and pleasant. The mine equipment is highly efficient, in good working condition and adequate for present requirements. It includes a 14-foot two-drum hoist, a 25-drill capacity Rand compound compressor, besides auxiliary machinery and well equipped shops for doing the repair work and also a large part of the construction work of the mine. The property is in fine physical condition and looks good for many more years of successful operation.

Improvements underway include one engine house, one 20x48 Sullivan First Motion Hoist, one 75-foot frame shaft house. In 1905, 25 new dwellings were completed for employes, which are highly appreciated. The property is efficiently managed and operated and conducted the best way for bringing the best results.

PIKE MINE.

Pickands-Mather & Co. have added the Pike to their Gogebic holdings. The property lies near the Brotherton mine and quite likely the product recovered by both mines comes from one and the same ore body.

This mine is located in Section 9, Town 7, Range 45, adjoins Chicago property on the east and borders on the Sunday Lake. Company employs 50 men and operates six machine drills. Mine is being developed through one shaft, 10x6 feet in dimensions, two-compartment, and 960 feet deep. Property contains a considerable deposit of ore and has a bright future. The management is conducting development work on practical lines and for better and bigger results. The 1906 product of ore was 17,934 tons as compared with 11,000 tons reported for 1905.

Property is well managed and economically operated. Equipment includes hoists, pumps, a six-drill capacity compressor and workshops conveniently located for economical and efficient service.

General manager, R. D. Pike; mining captain, A. S. Johns; postoffice address, Wakefield, Mich.

YALE MINE

This mine is operated by the Ashland Iron and Steel Company and owns 80 acres of land located just southwest of Bessemer in Town 47 and Range 46. Postoffice address, Bessemer, Gogebic County, Mich. General manager, William Wilkins; J. D. Shea, mining captain.

During 1906, 52,005 tons of ore was produced and 110 men employed. Its first product was made in 1901 and the total number of tons produced previous to 1906 was 197,027.

Ore body mined is iron ore and runs 62.50 per cent iron and .036 per cent phosphorus. Appearance of the ore body as regards size and quality while rather small, is good and promise better things with further developments.

The mine is opened and developed through one shaft, 10'6"x6'10" in dimensions, double compartment, and is about 1,391 feet vertical depth and average length of openings 800 feet. Skips are operated singly and carry 1.7 tons to a trip. Fifteen levels are being extended and the underground workings show continuous improvements in physical condition. Sinking and drifting are underway and the mine seems to be in for a prosperous period. Product is recovered through the "stoping" system and about 50,000 feet of timber was consumed last year in mine work. Five machine drills are operated and tram cars are operated by hand labor. Underground workings are comparatively safe and comfortable for working in and ventilation is good.

Equipment includes hoisting plant, six-drill capacity air compressor, pumping outfit, and supplementary fittings adequate for requirements and the mechanical equipment is run by steam power. Property seems to be in capable hands and operated right for bringing the best results and future prospects are considered fair.

EUREKA
CASTILE MINING COMPANY.

This company operates the Eureka, Castile and Asteroid mines.

The Eureka is located between the Mikado and Anvil mines at Ramsey, about two miles southeast of the town of Bessemer in Sections 12 and 13, in Town 47, Range 46, and owns 120 acres.

Geo. H. Abeel, General Manager; Charles J. Jones, Supt.; J. F. Rumsage, chief clerk; John Martin, mining captain; J. W. Weldon, engineer Postoffice address, Ramsay, Mich.

The mine became a producer in 1890 and continued to start out ore in a moderate way until 1896, when all shipments ceased. In 1906 the mine produced 38,757 tons of ore. The mine is now being opened up and developed on systematic and practical lines for energetic operations and the indications for making a successful mine are considered first-rate. The shaft has been sunk deeper, levels extended further and good progress

has been made in putting the property in a condition for sending out a regular product and its position has been materially strengthened. Some good stopes of ore have been developed and put in shape for economical mining and that which promises to turn out very well. Underground developments are conducted through one shaft 6 by 10 feet in dimensions, divided into two compartments and 870 feet deep. There are 50 men on the company's payroll and four power drills are operated. Mine equipment embraces a 12-drill capacity air compressor, three 72"x18"boilers one 20"x42" Sullivan hoisting engine, and buildings adequate for present requirements.

CASTILE MINE.

The Castile mine is located between the Eureka and Mikado mines with 320 acres of land on the strike line of the iron ore formation on the Gogebic range in Sections 12 and 13, Town 47 and Range 46. Mine location is just northeast of Ramsay. Ore produced is a Red Hematite, which runs 55 per cent iron, .045 per cent phosphorus. The organization is practically a new one, having been formed in 1903, and it made its initial product in 1904, which amounted to 823 tons of ore. In 1906 the mine produced 2,010 tons of ore. Mine is developed by means of one shaft substantially constructed and divided into two compartments. It is 8 by 16 feet in dimensions and 980 feet deep with five levels extended laterally for various distances. Levels are connected and air circulates freely through the underground workings. The proposition has an encouraging outlook and the general feeling seems to be that it will develop into a substantial mine, and a good business enterprise. The same officers manage both mines, except the mining captain, who is John Danielson. Development work continues on up-to-date methods and the physical condition of the property shows a healthy, wholesome growth. The people behind the enterprise are of the best type and mean business. They have put considerable money into the property and deserve to be rewarded. Developments indicate that they will be in a substantial way. Mine equipment includes a two-boiler hoisting plant, an air compressor, besides miscellaneous buildings, which are adequate for present requirements. Machinery is running smoothly and everything in and about the mine seems to be in good order. Location has a good appearance and the business affairs of the company are dispatched promptly and efficiently.

ASTEROID MINE.

The Asteroid mine is situated in Town 47, Range 46, in Ramsay, Mich., and owns 160 acres of land. This mine has the same officers as the Eureka mine. This company has just started to sink a shaft at this place, 10 by 17 feet outside, steel lined. It is designed to be one of the

finest shafts going and when through the over-burden and fairly underway, the work of running down into the vicinity of ore will be pushed forward with all possible speed with a view to economy.

VERONA MINING COMPANY.

The Mikado mine is operated by the Verona Mining Company.

This mine is located on the Gogebic Range, about three miles east of the town of Bessemer, in Section 18, Town 47, Range 46, and owns 160 acres of land. The company employed during 1906 a force of 175 men and produced 156,839 tons of ore. Mine became a producer in 1895 and up to the close of last season, 1906, has shipped a total output of 650,178 tons of ore. Ore produced is a high grade Bessemer, running 56.00 per cent iron and .245 per cent phosphorus. In any kind of market there is always a demand for these ores.

The mine is opened up and developed through two shafts, divided into two compartments and is 6x12 and 6x16 feet in dimensions and about 750 feet in depth. Mine looks well and is in fine physical condition and good for a substantial annual output for years to come. It is opened and developed on modern methods of mining and economically operated. Ore bodies developed are large and robust in character and there is an abundance of reserves underground that is fully up to the standard of the property. The circulation of air in the underground departments is good, and the producing points are comfortable for working in. Method used for recovering the ore is "subbing."

Development work underway includes sinking No. 2 shaft to the 12th level and driving a crosscut south from No. 1 shaft. The company has installed a first motion plant and in the future hoist the bulk of the product through that shaft. The general equipment of the mine is adequate for requirements for a considerable time.

Everything in and about the property is in good order and running smoothly. General manager, C. H. Mungor, Duluth, Minn.; general superintendent, C. E. Walton; mining captain, James Coole; engineer, E. F. Numsen; chief clerk, Theodore Dalnodar. Postoffice address, Verona, Gogebic County, Mich.

BROTHERTON IRON MINING COMPANY.

This mine is located northeast of the town of Wakefield in Section 9, Town 47, Range 45, and adjoins the Sunday Lake mine on the northeast. Property consists of 120 acres well located within the iron belt. Property has a good record and is credited with having produced previous to 1906, a total output of 1,301,127 tons of ore. Company employs 170 men and produces a Hematite ore running about 58.47 per cent iron and .029 per cent phosphorus. In 1906, the company produced 139,368 tons of ore. The mine is opened up and developed through two working shafts each

7x12 feet in dimensions, double compartment, and No. 1 is 830 feet deep and No. 2 is 842 feet deep. No. 2 shaft was sunk 60 feet during 1906. A new shaft is underway and contemplated. One air compressor is operated and progress has been substantial and continuous. Shafts are substantially constructed, in good running order and doing satisfactory service. The ore is trammed by hand labor, dumped directly into skips and hoisted to surface. Shafts and levels are connected underground and air circulates freely through the workings. No effort is left undone to make the mine safe and secure for taking out the product and a considerable quantity of timber is consumed annually in the work. Ventilation is good and the mine is comfortable for working in. The underground department is opened up and developed on practical lines and the different levels contain substantial ore bodies of distinct values. Product is recovered through the best method for bringing the most satisfactory results. Physically, the mine is in good condition. The mechanical equipment needs strengthening and by doing this, the position of the mine would be improved and bigger and better results may be obtained. Property is well managed and economically operated.

The Pickands-Mather Company, operator of the Brotherton and Sunday Lake mines, Gogebic range, is preparing to greatly improve the properties during the next two years. A new four-compartment shaft, 8x24 feet, was started at the Brotherton. The shaft will be supported by steel sets and will be covered by a steel shaft house. It is expected that ore will be hoisted through it in about two years. The shaft will be sunk about 45 feet per month. A new 20-drill compressor is going in at the Brotherton, as are two new boilers, and at Sunday Lake, a triple compound pump is to be installed. It will have a capacity of 1,000 gallons a minute. The past year has been a record breaker with these two properties.

SUNDAY LAKE IRON COMPANY.

This mine is located just northeast of the Town of Wakefield, in Section 10, Town 47, Range 45, and owns 320 acres of mineral land, adjoining the Brotherton on the northwest. Company mines a Hematite ore running 59.33 iron and .025 phosphorus. The mine has been operated for many years and is credited with having produced since the beginning of operations, previous to 1906, 913,355 tons of ore. 1906 product was 81,554 tons. The mine is opened and developed through two working shafts, 7x12 and 7x16 feet in dimensions, and two-compartment. 130 men are employed and 5 machine drills are operated in opening up the mine and blocking out ore reserves. Shaft connections are effected on different levels and levels in turn are connected by raises or winzes and form quite a network of underground openings that efficiently ventilate the workings and make them cool and airy. In a cool, airy mine, men can always do a good day's work. No reasonable expense is spared in making the mine safe and solid and considerable quantities of timber are consumed

annually in this work. And this work must constantly be kept up, or the product will soon stop coming to the surface. The best method is used for taking out the product, which is the "subbing" method. All tramming is done by hand labor. Trams dump directly into skips, which are hoisted to surface and in turn dumped into ore cars and the load transferred to the stockpile. The work is readily and economically done. Operations are conducted on practical lines and the management aims to get out the best there is in the property and in the most business-like way. Results accomplished have been fairly substantial and should be, in the main, satisfactory. Mechanical equipment is in good running order and includes hoisting plants, an air compressor plant, pumping outfit, workshops conveniently located and supplementary appliances adequate for requirements.

General manager, C. H. Mungor, Duluth, Minn.; superintendent, C. E. Walton; mining captain, A. L. Trebilcock; engineer, A. L. Smith; chief clerk, Theodore Dalnodar. Post office address, Wakefield, Mich.

MICHIGAN BLAST FURNACES

Ten charcoal blast furnaces were operated in Michigan, during the year 1906 making pig iron. All are well equipped for the work and in first class condition. The largest percentage of iron ore is now shipped east to points along Lake Erie, near the coal fields and where cheap fuel may be had the year round.

Following are the charcoal furnaces operated:

PIONEER IRON COMPANY

Geo. A. Garretson, president; William G. Mather, vice president; Fred A. Morse, treasurer; E. V. Hale, secretary; Austin Farrell, superintendent.

This company operated three furnaces: Marquette furnace located at Marquette; Gladstone furnace, located at Gladstone; Carp furnace, located at Marquette.

The Marquette furnace was in operation during 1906 and produced 35,728 tons of pig iron.

The Gladstone furnace was in operation during 1906 and produced 36,055 tons of pig iron.

The Carp furnace employed on an average 40 men and made 15,420 tons of pig iron during 1906.

THE SPRING LAKE IRON COMPANY

J. C. Ford, president and treasurer. Post office address, Fruitport, Mich.

The average number of men employed during 1906 was 85 and 25,521 tons of pig iron were produced. Tons of ore consumed, 48,632; bushels of charcoal consumed, 2,403,590; tons of limestone, 2,246.

MITCHELL-DIGGINS IRON COMPANY

Jos. C. Ford, president; W. W. Mitchell, vice president; Edward Fitzgerald, secretary; Delos F. Diggins, treasurer. Post office address, Cadillac, Mich.

This furnace was in operation during 1906 and produced 22,625 tons of pig iron. Iron ore used, 44,436 tons; limestone, 3,393 tons; charcoal, 2,567,450 bushels.

ANTRIM IRON COMPANY

T. J. O'Brien, president; J. C. Holt, secretary-treasurer; N. M. Langdon, manager. Post office address, Mancelona, Mich.

The average number of men employed during 1906 was 85 and 30,530 tons of pig iron was produced. This furnace was idle 46 days in 1906.

BOYNE CITY CHARCOAL AND IRON COMPANY

Chas. H. Schaffer, president; Frank B. Baird, vice president; Fred Smith, secretary-treasurer. Post office address, Boyne City, Mich.

This company employed 53 men during 1906 and produced 22,613 tons of pig iron.

ELK RAPIDS IRON COMPANY

Lincoln Brown, president; E. G. Rust, vice president and general manager; C. D. Towne, treasurer. Post office address, Elk Rapids, Mich.

This company employs on an average about 55 men and produced about 31,611 tons of pig iron during 1906.

MANISTIQUE IRON COMPANY

General office, Detroit, Mich.; furnace, Manistique, Michigan. W. H. Nelson, manager at furnace.

This furnace was in operation during 1906 and employed 325 men; 35,513 tons of pig iron was produced.

MICHIGAN IRON COMPANY

General office, Detroit, Michigan; furnace, Newberry, Michigan; E. E. Johnson, manager.

This company produced 23,694 tons of charcoal pig iron in 1906 and employed somewhere in the neighborhood of one hundred men on an average.

RECAPITULATION

Pioneer Iron Co.	87,203	Austin Farrell, Marquette, Mich.
Mitchell-Diggins Iron Co.	44,436	J. C. Ford, Cadillac, Mich.
Boyne City Charcoal Co.	22,613	Fred Smith, Boyne City, Mich.
Michigan Iron Co.	23,694	Joseph H. Berry, Detroit, Mich.
Spring Lake Iron Co.	48,632	J. C. Ford, Fruitport, Mich.
Elk Rapids Iron Co.	31,611	E. G. Rust, Elk Rapids, Mich.
Manistique Iron Co.	35,513	W. H. Nelson, Manistique, Mich.
Antrim Iron Co.	30,530	N. M. Langdon, Mancelona, Mich.
Total	324,232	

THE COPPER INDUSTRY

THE COPPER INDUSTRY

COPPER AND THE COPPER INDUSTRY.

Copper still ranks next to iron in value among the metals produced in the United States. In 1906 copper mining companies had another record year and make a magnificent showing. Lake copper opened the year at 19½ cents per pound, dropped to 18⅝ and closed at 25, an advance of 5½ cents a pound. Stimulated by these high prices for the metal producing mines and development propositions were operated to the limit with the force of men at command, and in many instances, record products were made. The only draw-back was an insufficient supply of intelligent labor to meet the requirements. Had there been men enough to go around, the year's product of copper would have been considerable more than the amount reported.

The production of copper in the United States in 1906, according to the figures prepared by the Engineering and Mining Journal was 917,620,000 pounds as in comparison with 875,541,771 pounds produced in 1905. These figures show a gain for the year of 42,078,259 pounds or 4.8 per cent. Figured at 18½ cents per pound, the total value of the United States product of copper in 1906 amounted to the enormous sum of $167,241,600 or equivalent to $2 each for every man, woman and child in the Union.

Of late, the world's demand for copper has exceeded the supply and this condition has occurred despite the fact that producing companies are operating their mines to the utmost capacity and increasing products right along. In many districts, great progress has been made in all departments of mining and managements are continuously striving to get out heavier products. But in spite of all efforts put forth, the consumption of copper appears to outstrip production and absorb supplies faster than any can be taken out the mines. Among domestic consumers, the United States Government contracted, during the year, for 2,600,000 pounds of Lake copper at 18.85 cents per pound. The consumption of the metal continues at an enormous rate and increasing with record speed. It is a question whether the extent of electrical expansion is fully realized. As an instance of what is going on in the electrical department, it is estimated that 425,000,000 pounds of copper were in use in the various telephone lines of the Bell companies last year. In 1907 there is expected to be an increase of over 50,000,000 pounds added to the lines. An authority remarks: The electrical industry though apparently highly developed in several countries, would in reality seem to be still in its infancy, for schemes which have hitherto scarcely been thought practical, are now seriously taken in

hand, especially those in the direction of power transmission and electrification of railroads. Most of the leading establishments in America are already so full with work for the coming year that rapid expansion of plant has become necessary in order to cope with the constantly increasing demands. Some of the large manufacturers who are thus able to judge the position of copper very clearly are now looking after the provision of their requirements of the metal as far ahead as they can secure it and are buying very freely from American producers."

Though the product of copper last year was the largest on record and exports were 204,628 long tons, yet the foreign visible supply, at the end of the year, was but 14,223 tons of a very inferior grade. Less than two weeks' consumption for the United States.

Another authority remarks: "The United States is the largest producer and heaviest user of copper in the world. All over the world, copper mines are being exhausted, while those in this country are each year giving up a greater quantity of the metal. Europe is now as dependent on American copper as she is on the American cotton.

A famine of the ore would stop electrical process in Germany, France and Holland as completely as a curtailment of the southern staple checks the looms in the mills at Lancashire. Only a generation ago Europe supplied her own needs. Then she took but a paltry $800,000 worth of copper from us. In 1905 her bill for the metal was $86,225,000. At the present rate of expansion it will be $100,000,000 before 1910. In the same period the American yield has grown from 27,000 long tons a year to 421,982 tons. Reduced to the grade unit of measure, this means a growth of from 60,000,000 to 925,000,000 pounds.

Ten years ago the value of American copper was around $50,000,000. By 1889, the birth year of the great "copper trust" it was $101,000,000. It dropped to $76,563,000 in 1902, when the bubble burst and the metal fell nearly to 10 cents per pound, but was up to $146,000,000 in 1905 and will be nearly $185,000,000 this year. Coal and pig iron are the only two products of American mines that realize a greater value than copper."

Domestic consumers are doing a tremendous business and using an enormous quantity of copper. The consumption going on for electrical purposes by telephones, electric lighting and other companies, is enormous and unprecedented. And there are plans on hand for the electrification of a considerable mileage of steam railroads. These will require large quantities of copper. Then there are no copper combinations or trusts in the world. The metal stands on the legitimate basis of supply and demand. Producers act independently and sell to the firms that pay the pest prices, whether they be European, Oriental or American. European requirements continue to be an important factor of the copper industry and consumption across the Atlantic appears to be more than keeping pace with production. And since the closing of the Japan-Russian war, the world appears to be consuming more copper at 24 or 25 cents per pound than

the mines can supply. This would indicate that industries consuming copper are expanding faster than the producing mines. This condition, however, may not last forever,—it is hardly to be expected. In a year or two, this industrial activity may fall off and the production again overtake consumption. This seems to be the logic of events and history usually repeats itself. The average price of copper for 1906 was about 19.75 cents per pound. The year was an exceptionally prosperous one for copper mining and the outlook for the industry was never brighter than at the present time.

Following are the revised figures of the Engineering and Mining Journal on the production of copper for 1906 in the United States (in pounds):

State	1904	1905	1906
Alaska	2,043,586	4,703,600	8,700,000
Arizona	191,602,958	222,866,024	263,200,000
California	29,974,154	16,697,489	24,421,000
Colorado	9,401,913	9,854,176	9,565,000
Idaho	5,422,007	6,500,000	9,493,000
Michigan	208,329,248	218,999,753	224,071,000
Montana	298,314,804	319,179,885	299,850,000
New Mexico	5,368,666	5,638,842	6,262,000
South and East	15,211,086	14,907,982	18,821,000
Utah	47,062,889	51,950,789	49,712,000
Wyoming	3,565,629	2,393,201	146,000
Other States	1,418,065	1,550,000	3,379,000

Following are the visible supplies of copper at the end of each year (in tons):

	1906	1905	1904	1903
Dec. 1	14,243	13,690	16,044	12,743

COPPER EXPORTS

The following table shows the movement by years since January 2, 1902:

	1906	1905	1904	1903	1902
Total	204,628	239,863	247,735	168,767	94,664

World's copper production, figured by Henry R. Merton & Co., Ltd., of London at 711,675 tons against 682,125 tons in 1905 and 644,000 tons in 1904. The ouput of the principal producing countries compares for four years as follows (English tons fine copper):

United States	408,475	389,120	365,050	307,570
Spain and Portugal	49,320	44,810	47,095	49,740
Mexico	60,625	64,440	50,945	45,315
Chili	25,745	29,165	30,110	30,930
Canada	25,460	20,535	19,185	19,320
Japan	42,740	35,910	34,850	31,360

Germany	20,340	22,160	21,045	21,205
Australia	36,250	33,940	34,160	29,000
Miscellaneous	42,720	42,045	41,560	40,335
Total	711,675	682,125	644,000	574,775

The figures of production in the above table, rapidly as they have mounted in the past few years, should soon be surpassed by the output of the greater Calumet & Hecla. While some of the recent acquisitions have yet to demonstrate their extent of mineral wealth, the capabilities of the parent mine and of the producing properties the control of which has been obtained, justify the expectation of an annual yield of 150,000,000 pounds within a few years.

Following are the highest, lowest and average prices of copper for a period of twenty years:

Years.	Low	High.	Average.
1886	10.00	12⅛	10.95
1887	9⅞	17.90	11.22
1888	15.90	17.65	16.78
1889	11.00	17.50	13.49
1890	14.00	17.50	15.60
1891	10.25	14.50	12.76
1892	10.50	12⅜	11.56
1893	9.50	12.50	10.75
1894	9.00	10.25	9.52
1895	9.35	12.25	10.73
1896	9.75	12.00	10.98
1897	10.75	12.00	11.36
1898	11.00	13.25	12.05
1899	13.25	19⅜	17.76
1900	16.00	17.25	16.65
1901	13.00	17.00	16.72
1902	11.00	13.50	12.16
1903	12.00	15.50	13.70
1904	12.25	15.50	13.27
1905	14.75	20.00	15.70
1906	18.00	25.00	19.50

LAKE SUPERIOR COPPER PRODUCTION.

Mines—	1902.	1903.	1904.	1905.	1906.
Calumet & Hecla	81,248,739	76,490,869	80,341,019	82,500,000	95,000,000
Osceola	13,416,396	16,059,636	20,472,429	18,938,965	18,588,451
Quincy	18,988,491	18,498,288	18,343,160	18,827,557	16,194,838
Tamarack	15,961,528	15,286,093	14,961,885	15,824,008	9,832,644

Mines—	1902.	1903.	190.	1905.	1906.
Champion	4,165,784	10,564,147	12,212,954	15,707,426	16,954,986
Baltic	6,285,819	10,580,997	12,177,720	14,384,684	14,397,557
Trimountain	5,732,160	9,237,051	10,211,230	10,476,462	9,507,933
Wolverine	6,473,181	9,024,034	9,764,455	9,464,418	9,681,706
Mohawk	225,824	6,284,327	8,149,515	9,387,614	9,352,252
Atlantic	4,949,366	5,505,598	5,321,859	4,049,731	1,539,082
Franklin	5,237,460	5,309,030	4,771,050	4,206,085	4,228,650
Michigan	166,898	275,708	2,746,127	2,891,796	2,875,341
Isle Royale	3,569,748	3,134,601	2,442,905	2,973,761	2,937,098
Mass	2,345,805	2,576,447	2,182,931	2,007,950	2,106,739
Adventure	606,211	2,182,608	1,380,480	1,606,208	1,552,628
Phoenix		202,823	1,162,201	273,219	
Winona	101,188	1,036,944	646,025		278,182
Centennial			641,294	1,446,584	2,253,015
Ahmeek			376,687	1,552,957	3,486,900
Allouez				1,167,957	3,486,900
Arcadian	445,000				
Tecumseh					58,008
Miscellaneous	250,000	50,000	50,000	75,000	
	170,480,598	192,299,191	208,329,248	217,762,382	224,407,859

Product of Calumet & Hecla for the fiscal year 1905-6 was 101,031,799 pounds.

DIVIDENDS PAID.

	1906.	Total Dividends.
Calumet & Hecla	$7,000,000	$99,350,000
Copper Range	2,302,686	4,221,591
(*a*) Baltic	1,400,000	2,650,000
Quincy	1,375,000	16,595,000
(*b*) Champion	1,200,000	
Tamarack	300,000	9,000,000
Osceola	961,000	5,785,700
Wolverine	1,020,000	3,930,000
Mohawk	500,000	500,000

(*a*) Subsidiary to Copper Range; (*b*) 50,000 shares controlled by Copper Range and 50,000 shares owned by St. Mary's Mineral Land Co.

LAKE COPPER MINING IN 1906.

In 1906 the copper mines of Michigan had a year of wonderful success and general prosperity. All former records were eclipsed in the number of men employed, quantity of refined copper produced and amount paid in dividends in a single year.

The demand for copper was continuous, sometimes urgent and its prices rose to 25 cents per pound and averaged for the year 19½ cents. Stimulated by such remunerative prices for the metal, producing mines were operated to the utmost of their capacity. In a few instances record products were made. Only for labor troubles and unpreventable mishaps and mine disasters, general results would have been much better still. Laborers were scarce and demanded higher wages than the companies in some instances felt they could afford to pay for brief periods, a number of mines were closed down. As a result, products fell off somewhat. Differences, however, were finally adjusted and the mines were started up again and operated with customary vigor.

The total amount of copper produced by the Lake copper mines in 1906 was 224,407,859 pounds as compared with 217,762,382 pounds produced in 1905 and showing a gain over the previous year of 6,645,635 pounds or 3 per cent.

For its fiscal year ending April 30, 1906, Calumet & Hecla reported a product of 101,350,000 pounds. This, I think, broke the world's record for a single producer.

At any rate combining quality and quantity, it likely forms the most valuable year's product of copper thus far recorded by any company in the annals of the copper mining. For the calendar year the company produced 95,000,000 pounds as against 82,500,000 in 1905 showing a gain of 12,500,000 pounds or 15 per cent above the previous year's production. The company paid in dividends $7,000,000 as compared with $5,000,000 paid during the previous year. Besides paying $70 per share to the stockholders, the company strengthened its already splendid surplus to the extent of over $37 per share.

Copper Range Consolidated including all of Champion produced 40,860,476 pounds of copper as compared with 40,568,572 pounds produced in 1905. In this year, the company paid four dividends aggregating $2,304,810, expended for new construction $392,990 and added $495,308 to the surplus.

Owing to underground disturbances, Quincy's ("Old Reliable") production for this year was but 16,194,838 pounds as compared with 18,827,557 for the previous year. The company, however, paid $1,250,000 in dividends and for 1907 put the stock on a $4.50 quarterly dividend basis.

Osceola Consolidated's product was 18,588,451 pounds. This is slightly less than the quantity reported for 1905. The shrinkage was caused through a fire in Kearsarge No. 2 shaft. The company earned twice as much as the amount paid in dividends in any previous year. Two dividends of $6 per share were paid and the treasury surplus increased by $469,389.

Champion produced 16,954,986 pounds of copper and paid $1,200,000 in dividends. Baltic distributed $1,400,000 and produced 14,297,557 pounds of copper.

MINING ENGINEERING BUILDING.

"Little Calumet & Hecla"—Wolverine—produced 9,681,706 pounds of copper for its fiscal year and paid in dividends $1,020,000 or $17 per share.

Mohawk, a Keweenaw county property, produced 9,352,252 pounds of copper and the company paid from earnings of 1906, two dividends of $3 and $4 per share respectively, aggregating $700,000, or $7 per share.

In January, a fire broke out in Tamarack which is still burning but, at present, doing no serious injury. It put two shafts out of commission all the year and nothing could be done in the third shaft for months.

At Atlantic, early in the year, all the hanging wall side of the mine crushed in and completely put this company out of business for the time being, as a producer of copper.

Air blasts occurred in the Quincy and so shook up things and frightened men that they refused, while the "quakes" were going on to venture underground. Then a nasty fire broke out in Kearsarge No. 2 shaft and burned out the skip road and timber work to such an extent that it took months to repair and get the shaft in running order again. These mishaps and disasters proved sufficient to keep in check what promised at its opening unequalled achievements as a result of the year's work. Yet upon the whole, 1906 was a year of substantial progress and splendid prosperity.

The companies in general have been stretching out for better results and continued progress has been made in all departments of mining. There was work for all at good wages and a larger force was employed, all told, than ever before.

The positions of Allouez, Ahmeek, Winona, Victoria, Keweenaw Copper and other mines were improved and strengthened. Additional equipments have been installed in many of the mines, underground reserves enlarged, the methods in use for taking out the products, in some instances modified, the efficiency of the stamp mills increased by compounding heads and other changes made for washing the copper.

The people behind the mines know the mining business thoroughly and conduct it for the best interest of the companies, and likewise for the future well-being of the properties. Future requirements are anticipated, kept well in the foreground and provided for in good season. To anticipate the future is the most important effort of human effort and intelligence. Mines are opened up on broad, practical lines and economically operated. The splendid success achieved, all over the Upper Peninsula only becomes possible by taking out enormous products with the aid of the best machinery the genius of man can invent and money buy, combined with a thorough knowledge of the business by the managements and working the mines in the best way for bringing the best results. Prices of copper keeps up around 25 and 26 cents per pound and companies are making good profits.

Never before were there so many men employed in and about the Michigan copper mines as at the present time nor were men paid so high

wages in any previous period. In the Lake Superior region men are provided with better dwelling houses, more useful conveniences and greater privileges than in any other mining district on the globe. Yet there is a shortage of labor and good men are in demand. All things considered, the outlook for 1907 is superb.

HOUGHTON COUNTY MINES

HOUGHTON COUNTY MINES

The total number of men employed in and about the mines of Houghton County during 1906 was 16,506.

QUINCY MINING COMPANY.

Incorporated by special charter of the State of Michigan, March 30th, 1848. Organized under the mining Law of the State of Michigan, March 6, 1878.

Capital Stock, $3,750,000.

In One Hundred and Fifty Thousand Shares of Twenty-Five Dollars each of which 110,000 shares have been issued.

Officers: President, Wm. R. Todd; vice president, Walter P. Bliss; secretary and treasurer, W. A. O. Paull.

Quincy, often styled the "Old Reliable", is not yet through with doing nice things in a nice way and of a kind that make glad hearts of stockholders and likewise in doing, in a substantial way, just what the company is in the copper mining business for. At the last annual meeting of the company, the stock was put on a $4.50 quarterly dividend basis for 1907 and longer if conditions warrant. This calls for $495,000 every three months and $1,980,000 per annum. Quite a snug sum of money to be hauled out of "four or five holes in the ground" in a year's time. And what is to the point and of chief importance is the fact that with copper selling any where near its present price, such distributions can be made and maintained for years to come and no one knows for how long. Quincy is one of the most substantial and successful mining enterprises in the Lake district. From grass roots to present depth it has been a success. It is upwards of a half a century ago since the mine was first opened and without any let-up worth mentioning, it has been working away continuously ever since. Since the beginning of operations, the company has produced 372,477,987 pounds of refined copper, and paid 78 dividends aggregating $16,470,000 besides spending over $40,000,000 for operating expenses equipment, developing the mine and recovering the wilderness. For integrity and honesty, the company is above reproach and its credit is A.-1. From the beginning, the company's property has been managed with remarkable ability, and success and progress is stamped all over its works from end to end. Upon the whole, the mine never appeared to much better advantage than at the present time and its future is of the best and brim full of good things to come. Behind the organization are some of

the best mining people in the country, who know the business of mining thoroughly and do it as it ought to be done and for the best interest of the stockholders and all in any connection with the enterprise. The policy of the management has always been liberal and progressive—a continuous stretching out for bigger and better things. The substantial progress made shows that it has been an eminently successful one. And it is quite evident that a continuation of the same excellent policy is to be maintained and perhaps intensified. In the latter part of 1906, the company purchased 800 acres of mineral land from the Arcadian Copper Mining company for $750,000. It is good opinion that this was a master stroke on the part of the Quincy management. Including the new purchase, the land now owned by the company consists of 29,800 acres. The new purchase carries the Pewabic lode—the lode the company is mining—for over a mile and a half in length in its strike line. The lode in the main openings of the Quincy mine, extending in the direction of this land, looks first rate and is well charged with heavy strong copper and promises to return values fully as good as the average of the mine. The purchase undoubtedly adds to the value of the Quincy property many times the price paid and will surely result in lengthening out the life of the company by many years. It will become immediately available to No. 8 shaft with its drifts extended to within 1000 feet of Arcadian boundary that was. At a comparatively trifling cost, drifts from the newly equipped No. 8 or Mesnard shaft now down 3000 feet can be run north to prove up this ground. Should these explorations show good values, as there is every reason to believe they will, there is sufficient territory for two additional shafts. Just as soon as the snow is off the ground, diamond drill work will be started up to locate the lode and also to decide upon a site for a new shaft, which is planned for this quarter.

Quincy mine is described in my previous report.

The company is mining the Pewabic lode and a parallel belt known as the West Branch. Pewabic lode forms the main source of production and runs from three to eighteen feet in width. West branch is a narrow, pockety belt with product running to mass and barrel copper.

Quincy mine is opened and operated through five working shafts along on the strike line of the outcrop for over a mile in length and numbered 2, 4, 6, 7 and 8. All five shafts are connected at different levels underground. Developments are conducted on an enormous scale. Underground openings from one end of the mine to the other are over two miles in length. Large reserves are opened up ahead on different levels, so that men breaking down the lode can be distributed to the best advantage. The lode is extracted on the regular stoping system typical to the district, with modifications proved by experiments to be admirably adapted for the work. Dry walls built of waste rock take the place of stull timbers, and but little of it is consumed in taking out the product. There are 2,000 names on the payroll and no reasonable expense is spared in making every department of the mine safe for working in.

One hundred and fifty power drills are operated and the daily output of rock is now about 3,800 tons, and capacity of air compressor plants is about 225 drills. Underground tramming is done by an electric haulage system installed in 1901. The Quincy was the first mine to introduce this power for underground use in the copper district. It works admirably and is a decided improvement over hand labor and much more economical. Trams dump into pockets formed in the hanging wall at shafts. Skips are filled from pockets by lowering aprons operated by levers. No time is lost by trammers in waiting with loaded cars. The work is done easily and quickly. Skips scarcely touch the gates before they are hoisted again. That means something to a deep mine where a large product must be sent up. The work of loading, conveying, dumping cars and sending up skips is skillfully performed. No. 8 is the northernmost shaft, sunk in Mesnard territory and designed to increase the output from that quarter. Mesnard is practically a new mine and has a fine plant. Underground working openings are extensive, and show up a strong lode containing profitable values. Each shaft has a separate plant of great power and high efficiency. Hoists are of direct action with large winding drums that raise with great speed skips counterbalancing in shafts carrying from six to eight tons to a trip. Skips dump automatically onto grizzles. Fine stuff passes directly through grizzles to rock bins; the coarse rock passes by gravity down chutes through crushers into bins. The product of rock is then ready for the stamp mill. Power houses and workshops are constructed with stone, trimmed with sandstone and look well. Workshops are equipped with modern tools and fittings and can turn out practically any kind of work.

Stampmills are located at Torch Lake, about four miles distant, where the company has a large lake frontage with sand room for partically all time and water the year round. The company also has a smelting plant and does its own smelting and refining and a moderate amount of custom work. The stampmills are connected with the mine by the Quincy & Torch Lake Railroad, which was built and equipped by the company and does all the hauling for the various works of the mine.

Quincy stampmills are spacious, airy structures, well lighted and equipped with eight powerful heads, that in turn, are fitted with the best machinery known for washing and saving copper. Works are about as automatic as they very well can be and all appliances are modern. Water for concentrating purposes is pumped from the lake by huge pumps of enormous capacity. The plant is very complete.

J. W. Shields is mill superintendent.

The Quincy Company's equipment is very complete and in every particular in running order, and the mine is in fine physical condition and good for many more years of successful operation.

Superintendent, Chas. L. Lawton; chief clerk, F. J. McLain; head mining captain, Thos. Whittle; Chas. Kendall, assistant mining captain, North Quincy; Geo. Jacobs, assistant mining captain, South Quincy.

FALLING OFF OF 2,633,000 POUNDS IN 1906 PRODUCTION, BUT GAIN OF $257,000 IN NET.

Boston.—Quincy Mining Co. report for year ended Dec. 31, 1906, is issued. The income account compares:

	1906.	1905.	1904.	1903.
Pounds copper	16,194,838	18,827,557	18,343,160	18,498,288
Gross Receipts	$3,159,011	$2,981,120	$2,444,749	$3,447,351
Expense at mine	1,662,520	1,715,419	1,594,711	1,573,863
Construction	138,560	138,732	106,002	117,775
Smelt. & Miscellaneous	162,356	190,503	194,110	234,590
Profit	1,195,575	936,466	549,926	521,123
Other income	27,411	29,285	27,630	17,804
Total net	1,222,986	965,750	577,555	538,927
Dividends	1,250,000	600,000	500,000	550,000
Surplus	*27,014	365,750	77,555	def 11,074

*Apparent deficit.

Owing to the disturbances underground during the early part of last year, the company's earnings are reported in two parts; that is, for the nine months ended Sept. 30 and for the last quarter of the year, for the reason that October, November and December were the only three consecutive months of 1906 when mining operations were continued under nearly normal conditions.

The product of the mine was 26,366,101 pounds of mineral, yielding 16,194,838 pounds of refined copper. The copper was sold for $3,159,011.

In the first nine months of the year the company produced and sold 11,237,716 pounds of copper for $2,097,409; mining, smelting and transportation expenses were $1,256,558, leaving net of $840,851. During the last quarter of the year there were sold 4,057,122 pounds for $1,061,601, expenses were $520,531, leaving $541,071 net.

The apparent deficit in the income as presented after dividend payments is accounted for by the fact that the first dividend paid in the year, amounting to $500,000, was declared from previous year's operations, the surplus on Jan. 1, 1906, standing at $1,312,591. Balance of assets on Jan. 1, 1907, was $1,220,532.

In connection with the purchase of the Arcadian land, the following is presented:

Paid for Arcadian land, in cash and notes	$750,000
Interest deferred payments	15,045
Total payments	765,045
Received from 10,000 shares increased stock offered at $70	700,000
Balance	65,045

President Todd says in part in the Quincy Mining annual report: The mineral land purchased adjoins the Quincy mine on the north and west and carries the outcrop and dip of the Pewabic lode for about a mile and

a half upon which lode this company has successfully operated for 50 years; and this land belonging to the Arcadian Co., it was thought wise by the directors to secure, because the southern part could be advantageously and economically mined through our No. 8 shaft.

By reason of the underground disturbances which created difficulties requiring most vigorous efforts to overcome in order to maintain a reasonable product, and the extra labor thus made necessary caused an increased mining cost. This in connection with the strike which occurred later, materially affected the annual production and increased the year's expenses.

Upon resuming work the men were given an advance in wages of about 5 per cent and later, owing to the increased price of copper another advance of 5 per cent was voluntarily granted to take effect Jan. 1, 1907. In his report Superintendent Lawton says: The air-blasts seem to have been a combined hanging and foot-wall movement, more especially the former. Some levels were thrown upward, others down; some closed altogether while many stopes were filled. Shafts 7, 2 and 6 were so badly crushed in places that at the time the skips could not be operated; 6 shaft being idle for ten days for repairs.

The greatest shaft troubles occurred along these sections where in crossing the lode, the shafts were in it or very close to it. The shafts have been and are being re-enforced. At present they are in excellent condition. The old stopes throughout the affected portion of the mine were so filled up that those parts are now more secure than ever before.

During the years of the Quincy mine's life the system of mining has been back and breast stoping, leaving pillars of poor rock where they occurred, and a floor pillar or rib of carrying thickness, according to the richness of the rock. As the mine attained greater depth the point of breaking strain of all the pillars was finally reached, and the great disturbance came. The cause was insufficient pillars and hanging wall supports.

Prior to Feb. 9 we had commenced to select the poor rock in the stopes to fill them up and save expense; we had also begun to blast down walls to more completely fill the stopes as fast as the copper rock was removed, thus to lessen the danger and effects of air blasts. Since then, wherever practicable, we have been changing over to this method of mining. By leaving large shaft pillars and the rib or floor pillars, together with filling the stopes, we feel confident that the bad features of air blasts will be eliminated. Nearly all these stopes and workings that were in operation on Feb. 9 and were crushed have been recovered, and the copper rock removed and the levels finished.

It has been found possible and profitable to mine and treat a lower grade of rock than heretofore. Thus the aggregate production of copper has been kept up notwithstanding the lower percentage of metal in the rock that was stamped, and the resources of the mine largely increased.

Development openings have been driven 23,690 feet and have proven considerably more than the average quantity of copper rock, which in cop-

per contents is fully up to the usual run of the mine. No. 7 shaft was sunk 288 feet; No. 6 shaft 73 feet. All shafts, except No. 4, are being pushed downwards. In the future they will be kept ahead of requirements. Practically completed changes have been made for handling No. 4 shaft rock to and at No. 2 shaft. No. 8 shaft is developing quite satisfactorily. The main shaft was timbered and completed 200 feet to the 43d level. The output of the shaft has increased from January daily output of 370 tons to an average per day of 1200 tons.

The shaft equipment is the most efficient plant, none other showing in any department of it, so low a cost for handling rock.

The Quincy & Torch Lake R. R. handled 1,117,000 tons of freight during the year. At the stamp mill many repairs, renewals and additions have been made. Both mills have shown satisfactory efficiency during the year. The smelter has continued along the lines of improvement that were laid out a year ago. Total mineral smelted was 2,288,356 pounds more than the previous year.

Of the purchase of 800 acres from the Arcadian, Mr. Lawton says: This area of 800 acres of land is practically all virgin mineral territory of the most promising character, and it assures the extension of the workings of the mine for the further distance of 1½ miles north on the present Pewabic lode.

HANCOCK CONSOLIDATED MINING COMPANY.

Organized under the mining laws of the State of Michigan, June, 1906. Capital stock, $5,000,000. In one hundred thousand shares of $25 each, issued. And one hundred thousand shares, not issued.

Officers: President, John D. Cuddihy; vice-president, Thomas Hoatson; secretary and treasurer, John H. Hicok; superintendent, John L. Harris.

ASSETS AND LIABILITIES.

December 31, 1906.

Assets—		
Cash	$390,150.01	
Supplies	8,900.11	$399,050.12
Liabilities—		
Accounts payable		$ 7,795.66
Balance of assets		$391,254.46

The property of this company is picturesquely situated on the side of the Quincy hill and along the sloping hill-side bordering the north side of Portage Lake and forms a part of the pretty town of Hancock. Portage Lake is connected with Lake Superior and forms the main waterway of the North and South Range mines of the Lake Copper district.

The company was organized June 11, 1906. The following mineral lands have been acquired, consisting of 936 acres, all in Township 55, north of Range 34 west, as follows:

Southwest quarter of Sec. 26 (less 24 acres)	136 acres	Old Hancock
Section 27	640 acres	
Southwest Quarter of Section 22	160 acres	
	936 acres	

Since the organization of the company, the surface right of the Anthony property (north half of Section 27) and various parcels of land have been acquired for right of way for two railroad spurs from the Mineral Range Railroad to Nos. 1 and 2 shafts; also 49 lots in the northeast quarter of Section 27 (Condon's Second Addition) in the immediate vicinity of No. 2 shaft.

Maps of the property are hereto annexed. As may be seen by referring to the maps, the lands lie to the southwest of, and adjoin the Quincy mine, one of the oldest and most successful dividend paying copper mines on the globe. These lands carry the Pewabic and West Quincy lodes—the lodes which Quincy people are working with splendid success and also the Sumner or Hancock lode. The management of the property is in competent hands, who know the mining business thoroughly and go at it in the right way for getting the best results.

John D. Cuddihy, the president of the company, is a Lake Superior product, a successful business man and self made. While not exactly a practical mining man, Mr. Cuddihy has lived in the copper district all his life and for many years has been in close touch with the most successfully conducted copper mining in the world. John L. Harris, the superintendent, is a graduate of the Michigan College of Mines and a post-graduate of the Quincy mine. Mr. Harris served in the Quincy for years as assistant superintendent under his distinguished father, Capt. Samuel B. Harris, and later as superintendent and made a first class record. To Capt. Samuel B. Harris is due largely the splendid success achieved at the Quincy mine during the past 25 or 30 years. Superintendent Harris of Hancock has had the best of training and knows the business to perfection.

The management plans to work the Hancock and Pewabic lodes and also the Hancock West lode. For the present, the Hancock two lodes will be developed and recovered through the Old Hancock Mine,—the Pewabic lode through a vertical shaft now sinking about 2,200 feet northwest of Hancock No. 1 shaft. No. 1 will be sunk deeper, levels extended into new ground and large bodies of ground opened up in the most practical way for economical mining. When finished according to the plans the shaft will be three-compartment and put in condition to handle a substantial rock tonnage daily. Already the old workings have been unwatered, put in ship-shape and rock is being hoisted out of the mine daily. At present, No. 1 shaft is sinble-compartment down to the 10th level and 906 feet deep. It is sunk on an angle of 54 degrees.

I visited the property a short time ago, and saw some nice vein rock hoisted out of the shaft and trammed to the stock pile. It was liberally charged with bright copper and had a good healthy appearance. It came from the 9th level. Everything connected with the property was running successfully and doing full duty. The average number of men employed was about 40 and four power drills were in operation. Of course, this is only a beginning. The mine force and number of drills operated will be increased as requirements demand. Besides clearing out the old workings and putting the property in shape for active mining 200 feet of levels and 90 feet of cross-cuts were driven last year. The lode shows up first-rate in the openings and carry the usual grades of copper. It is about 14 feet wide and fairly well enriched from foot-wall to hanging-wall. When opened up on up-to-date methods and put in condition to furnish a substantial daily rock tonnage, I expect to see the mine make a good record and develop into a profitable business enterprise. According to the company's records, when previously worked, the rock manipulated returned about 21 pounds of copper per ton treated. Today people who know mining don't ask for any thing better than that.

The vertical shaft when completed will be one of the finest in the land with capacity to lift an enormous rock output. And a couple of years—the estimated time for getting it down to the lode—will soon slip away. This shaft is designed chiefly to command the Pewabic-Quincy lode and I am informed by an authority of unquestioned integrity and who is thoroughly familiar with existing conditions, that the best courses of the lode in the deepest levels of Quincy No. 7 shaft and not very far from Hancock boundary is making right into Hancock territory just about where the vertical shaft will enter the new ground.

Superintendent Harris says in part in his report: "On account of the bad condition of the shaft, necessitating retimbering it from the 2nd to the 6th level and making general repairs from the 6th to the 10th level before any hoisting could be done, development work was confined to the 9th level, this being the only place where it was practical to carry on operations, The broken rocks being stored in the old stopes. This level was driven north on the main vein one hundred feet, but most of our work was done on the west branch where we did considerable "cutting out" with very good results and level extended south fifty feet, all in good quality vein, well charged with copper. Judging from the amount of stoping done, heretofore, on this vein—as well as on the main vein, in this vicinity of the mine—it is quite probable that good stoping ground will be blocked out, At a point of 65 feet north of the shaft, a cross-cut was driven west 60 feet to intersect the west branch.

Just as soon as the skip goes into commission, which will be within a few days, sinking of shaft will be commenced, the most promising levels cleared and extended, north and south, and stoping ground blocked out as rapidly as circumstances will permit.

During the time the mine was being unwatered, the following equipment was installed: A five foot single drum geared hoist, size of cylinders, 14 by 18 inches, the drum having a capacity of 785 feet of rope in a single coil. A Sullivan Compound Straight Line Air Compressor with single steam cylinders and tandem compound air cylinders. This machine, when running at the rate of 110 revolutions per minute, has a piston displacement of 1380 cubic feet of free air per minute. Two Fire Box Boilers of the locomotive type 100 horsepower each. A 13x20-inch Blake Crusher has been installed in rock-house and small engine for operating same will be in place in the near future.

No. 2 Plant.

Preparations were made during the latter part of November for sinking a vertical shaft 30x9 feet over all. It is located 2200 feet northwest of Quarter of Section 27, about 175 feet west of the north and south section line between Sections 26 and 27, and will contain five compartments, four of which are for two pairs of balanced Kimberly skips to operate in, while the other is for ladders, pipes, etc. The hoisting compartments will be 5 feet 2 inches by 7 feet inside of timbers and the pipe and ladder compartment 4x7 feet.

A three-inch air pipe was laid from No. 1 plant and ground broken for vertical shaft December 12th. The shaft was sunk 15 feet in a coarse, barren conglomerate vein, mixed with sandstone.

A building 16x44 feet for engine, boiler, and change house was erected and the small hoist and boilers that were formerly used at No. 1 were installed and will answer all requirements until the following equipment contracted for, to be delivered in the early spring and summer is installed:

One direct acting Duplex Hoisting Plant, consisting of two 24x48-inch Corliss engines of heavy design, and two hoisting drums, each to be eight feet in diameter by 9-foot face; each drum to be machine threaded to carry 4,000 feet of 1¼-inch rope in two layers.

Three Fire Box Boilers of one hundred twenty five horse power each.

One Rand Imperial Compound Steam and Compound Air Compressor having a capacity of 1,700 feet of free air per minute. This machine will work in conjunction with compressor at No. 1 plant, the total capacity being 3100 cubic feet of free air per minute, which we calculate will be sufficient for both plants until enough development work is done to warrant installing a larger machine, when these two compressors will be used as auxiliary machines.

As near as it is possible to calculate, No. 2 haft will intersect the Hancock West conglomerate, Hancock amygdaloid, Pewabic West conglomerate and Quincy main vein 2,000 feet, 2,500 feet, 2,800 feet and 3,600 feet, respectively.

An inspection of the geological section herewith submitted (which is made from the most reliable data obtainable) clearly shows the known lodes that exist farther north, which we assume traverse on our property in the same relative positions. The entire formation for a distance of 2,200 feet west of No. 1 shaft will be intersected, thereby exploring entire new territory.

Considering the amount of profitable stoping done at the Hancock mine, when last worked, the promising appearance of the vein since late operations have been underway, and the probabilities of No. 2 shaft intersecting paying veins, before reaching the Hancock West branch and main vein which are the only veins in this vicinity west of the Quincy "west lode" on which any extensive work has been done, it can readily be seen that our prospects are most favorable.

John O. Peterson, mining captain; Daniel Fisher, clerk; C. W. McDougall, engineer.

FRANKLIN MINING COMPANY

Company is capitalized at $2,500,000 in 100,000 shares, par value $25 each. Total assessments levied, $220,000, and dividends paid, $1,240,000.

President, Francis H. Raymond; secretary-treasurer, Daniel L. Demmon; superintendent, R. M. Edwards; clerk, Arno Jaehnig.

1906 was the best year this company have had in a long time and in consideration of the amount of work done, much of which must be classed as extraordinary, the results of the year's operations should be distinctly satisfactory. Perhaps the most important thing accomplished and that far outweighs every other achievement, even the net profit made was the re-opening of the Pewabic lode on the 21st level in the conglomerate showing, as Superintendent Edwards believes, copper in paying quantities. Supt. Edwards is conservative, capable, an expert geologist and does not go off at half-cock. There are now hundreds of feet of openings developed in the Pewabic lode at this level, and Supt. Edwards tells me the lode looks well to him and that he thinks a profitable mine can be developed in this formation in Franklin Jr. property. This is certainly good hearing and should be most encouraging to stockholders and everybody else who has faith in the property.

Franklin mine has been so extensively written up in newspapers and circulars that nearly everybody seems to know all about the property and what kind of a problem the management is struggling with and trying to form into a successful, profitable mine. Thus far, the property has been a disappointment, but the company has never lost faith in its ultimate success. If the company succeeds in making good in carrying the undertaking to a successful issue and win out where others have failed before, it will accomplish a grand work and should be accorded all the credit due such an achievement. And there are now substantial reasons for believing the property will make good. The company is operating two

separate mines—Franklin and Franklin Jr. These properties are described in my previous report, and any further description would not be much other than a repetition of which I have before written. Franklin is one of the oldest mines in the Lake district and for its size, only a few properties can boast of a better record. Since first opened, it has contributed to the world's wealth, millions of dollars worth of copper, paid $1,240,000 in dividends besides building up a mine and mine location that any company might be proud of. But the constant drain year after year has resulted in playing havoc with its copper bearing reserves and reduced them to very limited dimensions. However, the ground is holding out remarkably well and surprising many people. From this old mine, 67,146 tons of rock was hoisted in 1906. Franklin Jr. was bought with the hope that it might prolong the life of the company. The property is an interesting one with a large acreage carrying all the prominent copper bearing lodes mined in Houghton County, north of Portage Lake. It adjoins the land recently bought by the Quincy Mining Company from the Arcadian Copper company and is about four miles from the town of Hancock. The company is mining the Allouez Conglomerate lode in which there are two shafts sunk, Nos. 1 and 2. No. 1 is 2,400 feet deep and No. 2 is 1,500 feet deep. The company is also developing the Pewabic, sometimes called the Quincy lode. In 1906, all told, 559 men were employed and 47 machine drills operated. The company's annual report issued for 1906 makes a better showing than any similar statement issued in years. In an instance or two, it may be somewhat disappointing, but upon the whole, it presents a creditable condition of affairs. After charging the costs of all betterment work to the cost of the copper, the year's operations shows a net profit of $129,550. On Dec. 31st, 1906, the balance sheet shows the assets to be $237,949 over and above liabilities or the equivalent of $2.37 per share of stock. During the year, 372,378 tons of rock were treated, which yielded 4,228,650 pounds of refined copper or 11.3 pounds per ton of rock. In certain quarters, disappointment was felt because the yield of copper was only 11.3 pounds per ton of rock manipulated. But this is an improvement over the amount recovered the previous year. While the conglomerate may never be a rich lode, with a good round price for copper, it can be profitably mined. Some disappointment was also felt because the product of mineral was not dressed to a higher state of purity, its yield being but 47.6 per cent fine copper. This could be easily overcome by further dressing the product in the stamp mill. The main point here, however, is whether it pays better to do a little more refining in the smelting works, and less dressing in the stamp mill. The management knows the business and which pays the better. Franklin Jr. rock is not only the hardest mined in the district, but it is also the most difficult to treat in the stamp mill, for the reason that it contains a higher percentage of iron. For instance, stamp shoes last but a day and one-half crushing the Franklin Jr. rock while they last several weeks crushing amygdaloid rock. The mine is ably managed and economically operated.

The annual report of the company for the year ended December 31, 1906, compares with previous years as follows:

	1906.	1905.	1904.
Mineral produced (pounds)	9,599,944	8,375,290	8,447,335
Copper produced (pounds)	4,571,570	4,206,085	4,771,050
Copper sold, (pounds)	4,368,538	3,954,718	4,226,762
Copper on hand Jan. 1 (pounds)	203,032	251,367	542,288
Receipts—			
Received for copper sales	$ 811,998	$ 601,305	$ 545,213
Cash on hand	77,128	60,486	22,585
Received for interest	2,422	1,133	237,500
Old copper sold	40,080	82,281	179,845
Silver sold	.....	.....	258
Total receipts	931,629	$745,205	$985,403
Expenditures—			
Mine agents drafts paid	$ 658,939	$ 593,184	$ 580,084
Other expenses	80,456	74,892	77,333
Loans paid	.....	.....	267,500
Total expenses	$ 738,395	$ 668,076	$ 924,917
Surplus	$ 193,234	$ 77,128	$ 60,486

The balance sheets as shown of December 31, 1906, compares as follows:

ASSETS.

	1906.	1905.	1904.
Cash on hand	$ 193,234	$ 77,128	$ 60,486
Accounts receivable and capital on hand.	41,458	40,080	82,267
Supplies at mine	88,341	93,372	91,809
Total	$ 323,033	$ 210,536	$ 234,561

LIABILITIES.

	1906.	1905.	1904.
Liabilities at mine	$ 78,875	$ 80,941	$ 85,018
Drafts outstanding	1,417	16,012	14,758
Accounts and bills payable	4,792	5,184	9,105
Total	85,084	102,137	108,881
Balance assets December 31	$ 237,949	$ 108,399	$ 125,680

The directors present the following report to the shareholders for the year of 1906:

"There was a larger production of copper (some 365,000 pounds fine copper obtained from 1752 tons less of rock) than in 1905. The mass from the old mine fell off 124,390 pounds, as the old Franklin is gradually failing, but the mine still pays to work and may keep on for a long time At all events we shall keep it going so long as it produces as well as at present, product being 67,146 tons for 1906.

"The conglomerate is showing well, especially in the bottom of No. 1 shaft, and also in the No. 2 shaft at the 15th level and below.

"We have crosscut from the 21st level conglomerate to the Pewabic lode some 450 feet west, and have stoped on the lode (which is about 12 to 14 feet wide), some 300 feet, and will be opened by two more crosscuts below, which will open the lode at a greater depth than ever before.

"We also propose to drain the Pewabic shaft to the bottom from the 14th level, which can be easily done at an estimated expense of about $5,000, and open up some of the copper ground therein, which, while it would not pay in old times with copper at 10 and 12½ cents per pound, will easily pay at the going rate for copper at present.

"During the past year we have explored the Kearsarge lode from the crosscut opened some time since, but were unable to find anything of value.

"The amount of refined copper produced for the year was 4,571,570 pounds. The amount of mass copper was 342,920 tons. The cost of stamping per ton was 31.258 cents. Our average price of sales of copper was 18.603 cents per pound. The lowest price for the year was 15¾ cents, the highest, 19½ cents.

"During the year 1906 we erected another engine at No. 2 conglomerate which is working all right and was hoisting 170 skips daily instead of 120. We have also put in another head of stamps, and now have five in all.

"Our copper was largely sold in September and November for delivery in January and February, we, thinking the price a good one, sold in advance, but owing to accidents, bad weather, etc., it will be the latter part of March before it is all delivered; some of it was sold at 24 cents per pound.

"It will be noticed that the mine has, after charging to the cost of copper everything in the way of repairs, improvements, new engine, rock house, etc., the surplus account has gained the sum of $129,550.22, making the surplus $237,949.35 December 31st, 1906.

"Considerable money has been expended in making explorations, opening up the Pewabic lode, and also the Kearsarge lode which, at the depth opened has proved the value of both on the property. The old Franklin owns 1707.89 acres; the Franklin Junior 1359 acres, and the mill site at Grosse Point 217.70 acres or a total of 3284.59 acres on which with the buildings, improvements, etc., we are taxed for 1906, $7,280.61."

LA SALLE COPPER COMPANY.

Capitalization, $10,000,000 in 400,000 shares. Par value $25 each.

President, Quincy A. Shaw; secretary-treasurer, George A. Flagg; General manager, James McNaughton.

Main office, 12 Ashburton Place, Boston, Mass.; mine office, Calumet, Michigan.

This is a new organization under the control and management of the Calumet & Hecla Mining Company. For integrity, commercial and general standing, Calumet & Hecla people rank among the best, most progressive and most successful on the globe. Mr. James McNaughton, general manager of the Calumet & Hecla Mining company, is general manager of the new concern. That the property will be opened up and developed on up-to-date methods and in the best way for getting the best results goes without saying. Furthermore, it will be operated on a scale commensurate with its scope. The management knows the business thoroughly and will see that it is conducted on scientific principles. The general opinion is that a great big successful mine will be developed in these lands and profitably operated. As everyone knows, it costs big sums of money to open up and equip on modern methods, a substantial mine and some of the best people going have unbounded faith in the future of the property and are putting their money in its shares. In due time, they believe it will return fair interest on a valuation of its stock at higher prices than the shares sold for even in the recent copper boom.

The lands of the new organization include:

Caldwell, 560 acres; La Salle, 840 acres; Calumet & Hecla, 400 acres; Tecumseh, 560 acres; St. Mary's Mineral Land, 360 acres; Sheldon, 280 acres; total, 3,000 acres.

Practically every profitable lode thus far discovered and worked north of Portage Lake runs through these lands for a distance of over 12,000 feet in length on its strike line. Within the company's boundary line, shafts can be sunk to great depth, and levels extended from end to end of territory without a break. Its possibilities are enormous. To begin with, operations will be confined to the Kearsarge Amygdaloid, which happens to be one of the master copper bearing formations on the Lake district. Except for the intervening property of the Laurium company, this formation is now under development from the south end of the La Salle in Houghton county to the Gratiot in Keweenaw county—a prolongation of ten miles in length. The companies mining this lode include La Salle, Calumet & Hecla, Centennial, South Kearsarge, Wolverine, Kearsarge, Allouez, Ahmeek, Mohawk and Gratiot. These are pretty good mines for neighbors.

$1,000,000 are placed in the company's treasury for operating purposes, besides it has the backing of the Calumet & Hecla company, which is practically as good as many at command. Moreover, there are 100,000 shares of stock still unissued. It is planned to develop and work the La Salle through six modern shafts of large capacity sunk in the lode. Four of them are underway and sinking down in the formation with good copper values showing up in places. The other two will be started in the regular course of developments. Of the four shafts sinking, two are in the Tecumseh tract and two are in the Caldwell tract. Tecumseh No. 1 shaft is 1,000 feet deep, 6x18 feet in dimensions, three-compartment and

rapidly approaching a producing stage. Still considerable new ground must be opened up tributary to this shaft before it will reach a condition to furnish a rock output to meet modern requirements. The work of opening up the mine is pushed with much vigor, and considerable ground that will make copper fast, is being developed and put in shape for economical extraction. In this shaft, the lode has shown up well from the grass roots to deepest point penetrated and the latest reports from this quarter are quite favorable. In the latter part of 1906, a test of copper rock from this shaft was made at the Franklin stamp mill. The mineral product was refined at the smelting works of the Calumet & Hecla company and proved satisfactory to the present management of the company. After the test, rock shipments were discontinued. No. 2 shaft is practically a duplicate of No. 1, about 1,000 feet south and 45 feet deep.

The number of pounds of mineral produced in the test was 97,075 which yielded 58,008 pounds of refined copper. William Skewes is mining captain.

Caldwell is situated south of Tecumseh and adjoins Rhode Island on the north. Cross sections of this property has been diamond drilled and thoroughly tested by the company. Some fine cores of copper bearing rock have been taken out of there. Two modern shafts have been started here and are well underway in the solid rock. They are about 1,500 feet apart and may be sunk to a depth of 9,000 feet before reaching the company's boundary line to the west. Good progress has been made and the work is skillfully performed and in the most practical manner for the future of the property. Every new lift sunk and level developed adds to the worth of the property. The mechanical equipment is adequate for present requirements, but will be added to and strengthened as the exigences of requirements may depend.

Josiah Bartell is mining captain.

OSCEOLA CONSOLIDATED MINING COMPANY.

Capital stock, two million, five hundred thousand dollars. In one hundred thousand shares of $25 each.

Officers: President, Albert S. Bigelow; secretary-treasurer, W. J. Ladd; general manager, Norman W. Haire; superintendent, Will J. Uren; assistant superintendent, Frank H. Haller; clerk, William Veale; stamp mill superintendent,, A. L. Burgan; mining captain Osceola branch, James Rowe; mining captain South Kearsarge branch, Frank Landis; mining captain North Kearsarge branch, Jos. Biscombe; main office, 199 Washington St., Boston; mine office, Houghton, Michigan.

Just now, this company is in a peculiarly interesting position and attracting more widespread interest than all the other mines of the Lake district combined. Some of the best mining people in the country are awakening to a realizing source of the true worth and importance of the

mines owned by the company. Not only are the mines forming a consolidation in a prosperous condition, but they are among the best and most substantial ones on the peninsula. They posses great possibilities for much further development and expansion. The lodes mined are not the richest in copper contents, but are of medium grade with remarkable stability of values. For electrical purposes the copper recovered is of the very best and there is always a ready market for it. Except Tamarack Junior, which is idle, the mines never looked better than at the present time, nor promised better things, nor yet as good. In consequence of these facts and other considerations, there is a lively contention on between the managements of the Calumet & Hecla Mining Company and the Osceola Mining Company for control and operation of the mines.

Osceola Consolidated Company's property consists of four separate and distinct mines—Old Osceola, Kearsarge, South Kearsarge and Tamarack Junior. All four are valuable properties and also possess distinct strategic positions. Tamarack Junior, however, as before stated is idle, is supposed to be exhausted. When in operation the Calumet Conglomerate lode was mined. Osceola amygdaloid lode underlies every inch of the property and may pay to open and work. Old Osceola, Kearsarge and South Kearsarge look first-rate with the newest and deepest openings showing values fully up to the average of the mine. Old Osceola mines the Osceola lode while the two Kearsarges mine the Kearsarge amygdaloid. So far as enrichment goes, there is no great difference in the percentage of copper recovered from the two formations. Both are strong mineralized beds and possess great uniformity and permanency of values. For years the management has been binding its energies toward strengthening the position of the mines and increasing the product of copper. Shafts have been sunk deeper from year to year and miles of the lode have been developed and put in condition for economical extraction.

A considerable portion of the company's earnings have been put back into the property and spent to excellent advantage. The result is that the physical condition of the whole property is now in better form than ever before. Each mine is developed on up-to-date methods and operated the best way to get the best results. In every department the affairs of the company are skillfully managed and everything runs along smoothly. Only for the fire in Kearsarge, 1906 would have been a great year for the company and much better than it turned out to be, good as it was.

The company's annual statement is out and it shows an exceptionally prosperous one. In fact, it was the banner year in the history of the company. Earnings were twice as much as the amount paid in dividends in any previous year. This was due largely to the high price received for its product of copper. Two dividends of $6 each were paid from the year's earnings besides which the substantial sum of $469,389 were added to the treasury surplus. Since the beginning of operations the company has paid in dividends $6,362,600.

The success achieved has been substantial and may be readily appreciated by comparing the following statement showing the annual rock outputs, copper produced and profits made during the past four years:

	1903.	1904.	1905.	1906.
Tons rock treated ..	924,400	1,095,520	1,007,200	1,016,240
Lbs. cop'r produced	16,059,636	20,472,459	18,938,965	18,588,451
Net profit	$435,735.45	$662,819.77	$938,746.07	$1,623,189
Balance	$131,599.63	$505,929.40	$867,775.47	$1,337,164

Assets and Liabilities for 1905 and 1906:

	1905.	1906.
Assets including copper since sold	$1,691,115.75	$2,442,844.54
Liabilities, including advances on copper sold, but not yet paid for	823,340.28	1,105,680.37
Balance of assets, Dec. 31	$867,775.47	$1,337,164.17

On an average, all told, the number of men employed during 1906 was 1,475 and average number of power drills operated, 135. Total openings extended during the year were 24,834.8 feet or over 4½ miles.

The depths on the incline of the several working shafts on Dec. 31, 1906, were as follows:—

OSCEOLA.

No. 5 shaft .....4,248.3 feet
No. 6 shaft .....4,423.6 feet

NORTH KEARSARGE.

No. 1 shaft .....3,850.0 feet
No. 3 shaft .....3,117.3 feet

SOUTH KEARSARGE.

No. 1 shaft .....2,209.5 feet
No. 2 shaft .....1,787.0 feet

President Bigelow in his annual message said in part:

The directors cannot close this report without an expression of regret at the resignation of Capt. J. P. Richards. They feel that to his faithfulness and knowledge much of the success of the Osceola is due, and he takes with him into his richly earned retirement the respect and best wishes of the officers and directors of the company.

This tribute to Capt. Richards comes with good grace. It was earned with able, faithful, loyal service. Many years ago, soon after Capt. Richards engaged with the original Osceola Company, the late Capt. John Daniell in speaking of the Captain remarked to me that "perhaps Capt. Richards is as able a miner as ever came to the Lake Superior district."

Touching the fire in the Kearsarge and other matters, the following from General Manager Haire's report, together with general remarks, are decidedly interesting.

By the middle of the year we had completed, at great expense, very extensive repairs in this shaft. The skip road was lined up and made solid by filling in the spaces beneath the track with poor rock. New seven-ton skips with improved devices for keeping them on the track were substituted for old ones, which had given us much trouble. Everything worked smoothly until September 22, when a fire occurred on the 12th level which put the shaft out of commission. All the exterior openings of the mine were immediately sealed. In a few days the fire was extinguished, but the discovery was then made that, on account of the burning out of the supporting timbers used in sinking this shaft through the old stopes, an immense block of ground 30 feet in height, 24 feet in width, and extending from the 12th to the 14th level, had fallen into this shaft. This great volume of rock carried away all the shaft timbers and filled the shaft entirely full to the 25th level. As soon as the gas and smoke had left the mine repair work was begun. It is almost needless to say that this task has been both difficult and expensive. A large force of men has been kept at the work night and day. At this writing we have almost finished that part of the shaft where the cave-in occurred. Up to December 31 the cost of these repairs amounted to $19,836.56. This expense has been charged to the cost of mining. No copper rock has been mined or hoisted from this shaft since the fire. We expect to complete repairs and resume normal operations within the next ninety days. To prevent, if possible, future disasters of this nature, we are installing a system of sprinklers in the hanging wall of the shaft to keep the timbers and woodwork damp. The origin of the fire has never been ascertained, but was probably caused by friction or one of the rollers in the shaft. It started in the shaft at or near the 12th level. Fortunately no lives were lost.

GENERAL REMARKS.

Excepting the fire which closed down No. 1 shaft at North Kearsarge, and seriously cut down our product from that branch for the last quarter, 1906 was a successful year for Osceola Consolidated.

The cost of labor and all kinds of supplies was much higher in 1906 than the preceding year. This increased expense can only be overcome, if at all, by more economical methods of mining and handling our rock. For the past year our superintendents have arranged for a more systematic discarding of our poor rock underground. Where it is practicable we are putting in underground bins for storing and handling our copper rock; also in the longest drifts there will be installed a system of mechanical haulage as a substitute for the old method of hand tramming. Some of the drifts are now being straightened and levelled up for this purpose. The outlay for these improvements will not be large, and is fully justified by existing conditions.

On July 1, 1906, we established a purchasing department for all our mines, mills, smelter, and other auxiliary companies at the general office in Houghton. Mr. J. T. Reeder, formerly of the Tamarack Mining Company,

was placed at the head as chief clerk and purchasing agent. Favorable results have fully justified this arrangement. All supplies, including fuel, timber, powder, and everything for the use of our several departments, are purchased at this office, where we keep a complete set of books, showing cost and final disposition of every item.

In April, 1906, Mr. Frank H. Haller, chief engineer of the Oliver Mining Company's mines at Ironwood, Mich., accepted the position of assistant superintendent of the Osceola Consolidated. On October 1st, Mr. James Rowe of the Atlantic mine, Iron Belt, Wis., was given the position of mining captain of the Osceola branch. These gentlemen have materially strengthened our official staff. Captain J. P. Richards has resigned the position of head mining captain. He has been at Osceola for 30 years and has well earned a respite from his onerous labors. Except as above, the chief officers are the same as last year. Each one of our entire official corps deserves our commendation for the good faith and energy with which he has carried out the duties imposed upon him.

CALUMET & HECLA MINING COMPANY.

Alexander Agassiz, president; Col. T. L. Livermore, vice-president; Quincy A. Shaw, Jr., second vice-president; Rudolph L. Agassiz, third vice-president; preceding officers, Francis L. Higginson, Francis W. Hunnewell and James MacNaughton, directors; George A. Flagg secretary-treasurer; James MacNaughton, general manager; Walter Fitch, general superintendent; Will A. Childs, second assistant superintendent; W. M. Gibson, third assistant superintendent; James D. Ramsey, superintendent motive power; F. S. Eaton, chief clerk; E. S. Grierson, chief engineer; John Knox, chief mining captain; W. H. Cake, mill superintendent; James B. Cooper, smelter superintendent at Lake Linden; Morris B. Patch, smelter superintendent at Buffalo; Hon. Chas. Smith, chief mill and smelter clerk at Lake Linden works.

Main office, 12 Ashburton Place, Boston, Mass.

Mine office, Calumet, Houghton County, Mich.

Mill office, Lake Linden, Houghton County, Mich.

Smelter offices, Hubbell, Houghton County, Mich.; 1 Austin St., Buffalo, New York.

This company had a year of wonderful progress and prosperity in 1906 and the results obtained in practically every department far exceeds any previous year's work since the mine returned its first product of copper. A vast amount of betterment and re-construction work, which has been underway for some time, was completed and put in service and among all changes made and new installations and additions added, not a single one, so far as I know or have heard of, failed to make good and meet all expectations. The physical condition of the property is superb and its earning power for dividends greater than ever before.

During the year the active shafts referred to in my previous report were sunk deeper, levels extended further in the veins worked and a vast amount of new ground was opened up in the most practical way for economical extraction. In the deepest openings copper values hold out with remarkable persistency and new ground reserves are maintained up to the standard of the mine. Shafts in the Calumet conglomerate were vigorously operated and the output of rock fully maintained and even slightly increased from month to month. On the Osceola amygdaloid shafts which had been idle were re-opened, put in commission and an increased product of rock is now coming from this quarter. And the values in the formation are fully up to expectations. Development work in the Kearsarge amygdaloid formation also goes forward vigorously and progress has been substantial and of the sort that brings the best results. The mechanical equipment all over the property has been added to and strengthened wherever needed. Calumet stamp-mill has been remodelled, new fittings installed and the efficiency of the mill increased. Improvements and economics put in operation at the stamp-mills have greatly increased their capacity and resulted in reducing operating costs, and also in recovering a larger percentage of fine copper from passing out into the lake with the wash than formerly. This is an important achievement and aimed at for years. Plans are being completed for another large mill at Lake Linden. The new plant will be a re-crushing mill to treat the over-size sands and tailings of the Calumet mill. The building will be 365 feet long by 180 feet wide and contain 175 washing tables. The tailings from the Calumet & Hecla stamp-mills are estimated to be upwards of 35,000,000 tons carrying from 0.4 per cent to nearly one per cent of copper and to contain in the neighborhood of 200,000 tons of copper.

New furnaces were built at the smelting works, old ones overhauled, enlarged and the smelting plant has been put in condition to treat an increased output of mineral. Machine and carpenter shops, rockhouses, underground pumps and practically all the mine machinery, except hoisting engines and air compressors, are operated by electricity. The substitution of electricity for steam answers admirably for mine work, requires less space for equipment and does the work more efficiently and for lower costs. And there is still a vast amount of new work underway and planned for the future. All told there are over 5000 names on the pay roll and upwards of 260 power drills are operated.

The management of the Calumet & Hecla is considered as good as there is in the country. The company's affairs are transacted with exacting knowledge. System and order prevails in every department and all over the property. Every branch is in the hands of an expert, who knows his business thoroughly and does it promptly and efficiently. At the last annual meeting of the company, Mr. James MacNaughton, general manager, was elected a director of the company. This further recognition of his valuable services meets general approval. The continued success

achieved during Mr. MacNaughton's management is reflected all over the property and more forcibly yet in the annual reports of the company. So practical, far reaching and fundamental has been the improvements made in the methods of operating the property during the present manager's administration that the cost of producing the copper has been cut from about $5.00 to $3.50 per ton of rock treated. When it is remembered that the company mined 2,000,000 tons of rock last year, some conception of the effectiveness of the changes made may be realized.

During the year under review, the company mined and treated at its stamp mill upwards of 2,000,000 tons of rock, which yielded 95,000,000 pounds of refined copper as against about 1,900,000 tons of rock treated in 1905 and 82,500,000 pounds of refined copper recovered. The 1906 product of copper shows the substantial gain of 12,500,000 or 15 per cent over that of 1905. 1907 product will again show a substantial gain over the output of 1906. Dividends paid amounted to $7,000,000 or $70 per share, distributed as follows: $15.00 March 23; $15.00 June 22; $20.00 Sept. 20 and $20 Dec. 18. Amount of dividends paid the previous year was $5,000,000 of $50 per share. Since the beginning of operations the total amount distributed to the stockholders in dividends, including $20 paid March 23, 1907, is $101,350,000 or forty times the capitalization. Besides this pricely sum, before the consolidation of the company, Hecla mine paid $650,000 in dividends and Calumet mine, $300,000 or combined, $950,000. All told, Calumet & Hecla mines have paid $102,300,000 in dividends. No other mining company on the globe can show such a record and indications are that there are still better things ahead for the fortunate stockholders.

In the fiscal year, which ended April 30, 1906, the company produced mineral equal to 87,304,689 pounds of refined copper and reported a product of 101,031,799 pounds. The apparent discrepancy in products result from the fact that the company invariably keeps in stock a considerable quantity of mineral. Mineral is the stamp mill product or concentrates before it is melted and refined into ingot copper at the smelting works.

The copper of the Calumet & Hecla is recognized the world over as an excellent brand and sells in the market for the highest prices. A considerable amount of the products is exported and sold direct to the consumers. The company has no copper selling agents, but markets its own product to the best advantage and in the interest of stockholders. Following is the report of the Calumet & Hecla Mining Company during the fiscal year ending April 30, 1906:

"During the past year we produced mineral equal to 43,652 and six hundred and eighty-nine two thousandths tons of refined copper as against 43,090 and five hundred and forty-one two-thousandths tons last year. Our product of refined copper was 50,525 one thousand, seven hundred and ninety-nine two-thousandths tons; for the previous year our product of refined copper was 42,822 and four hundred and one two-thousandths tons The price of copper has varied from 15½ cents to 19 cents per pound. It is now about 18¾ cents.

There have been paid during the last year two dividends of fifteen dollars each and two of twenty dollars.

Captain Milligan, who has been in the service of the company for thirty-three years, has resigned his position as chief mining captain; he has filled for eighteen years the position of assistant and chief mining captain. During that time he has seen our yearly rock tonnage rise from 814,000 to 1,900,000 tons. Captain Milligan has been a faithful and industrious employee and devoted to his work, to which he applied, without stint, his energy and skill for the best interest of the company. Our general manager has placed Mr. James B. Risque in charge of the underground work of the company.

On the Calumet conglomerate, the sub-shaft from the 57th level northward has reached the 61st level, a length of over 1,000 feet. Some excellent ground has been developed by it. The quality of the rock tributary to the Red Jacket shaft has improved somewhat. The main body of the conglomerate mine remains as heretofore. To the south slight improvements occur spasmodically, but nothing of permanent value has as yet developed. We are taking out the pillars of the Hecla No. 11, preparatory to abandoning that shaft, and have also continued to take out the pillars of Nos. 2 and 3 Hecla. We are making extensive use of hardwood underground instead of pine; this has very materially lessened the cost of timbering. We are remodelling the main engine at the Red Jacket shaft, the original design not being satisfactory. Large skips of the capacity of 7½ tons have been introduced at a majority of the shafts on the Calumet Conglomerate. This has greatly increased our rock tonnage. During March we sent to the mill 195,480 tons of rock; of this 27,018 tons came from the Osceola lode. We are now obliged to run night trains to the mills, owing to our increased rock tonnage, which is becaming so large that it will be necessary for us in the near future to change our track from narrow to standard gauge by adding a third rail and altering the locomotives, in order to handle our rock economically on the railroad.

The openings on the Osceola amygdaloid have been satisfactory. No. 13 shaft has reached the 16th level and continues to open up good ground. Openings at No. 16 shaft are excellent and have now reached the 8th level. The ground developed around No. 14 shaft in the last few months is fair. No. 15 shaft has just been re-opened and we expect to reopen No. 17 in the near future. The openings of No. 19 and No. 20 shafts on the Kearsarge lode continue about as stated in my last report; they are below the 6th level and shaft No. 21 is down to the 1st.

We have derived a substantial addition to our ingot product and are now producing at the rate of about 6,000,000 pounds per year from openings on the Osceola lode; we are stamping about 1,000 tons of rock a day from this lode and intend to increase this tonnage as fast as practicable.

Since last May we have remodelled six of the Hecla Mill stamps so that we now have twenty-three modern stamps in commission. We have already started remodelling the remaining five old heads to treat amygdaloid rock and hope to have them in commission by May 1st, 1907. They will have a capacity of 3,000 tons daily.

The Calumet mill, as remodelled, has run most satisfactorily during the past year. The value of the copper saved each year by the new system of stamping and washing has thus far practically equalled the cost of reconstruction of the mill. A great part of the mill trestle connecting the bins with the railroad has been filled in. This work will be continued whenever practicable. The warehouse at the Lake has been moved to a new location on the extension of the coal docks.

We have continued our experiments upon the tailings from our mill and hope soon to make plans for the erection of a mill intended to save a good part of the fine copper we are now losing.

The addition to the electric power house at Torch Lake has been completed. Two of the large hoisting engines built for mining the Osceola lode have been erected there, so that we now have in our power house a capacity of about 9,000 horsepower; the building is large enough to allow the erection there of the third Osceola hoisting engine when needed, adding about 30 per cent to our available horse-power. Two independnt cable lines connect the electric power house with the mine, each capable of transmitting the total power developed at the power house. The Calumet mill, a part of the Hecla mill, and the lighting plant at the lake are run by electricity.

A fireproof building has been erected at the mine to serve as a substation for the distribution on the location of electric power to the various points where it may be needed. At the mine nearly all the rock-houses, the carpenter, blacksmith and machine shops are run by electricity. We are increasing the electric power at the lake and mine as fast as practicable. We are also adopting gasoline trucks for the distribution of smaller freight on the mine.

At the Lake Linden smelting works we have remodelled the laboratory to meet the growing demands of the smelter and mills. It will be necessary during the coming summer to rebuild our cupola furnace, remodel five of the remaining furnaces and build a new mineral house at a total cost of about $105,000.

At the Buffalo smelting works we have rebuilt one of our furnaces and installed two waste heat boilers. The whole of our plant is now run by electric motors, power being supplied by means of the generator in the central boiler plant at our electrolytic works.

We lost by fire on the 31st of August of last year both the High School and the Manual Training School. We are replacing these by a

large fireproof building of greater capacity than the former buildings. The greater part of the cost of this building will be defrayed from the insurance fund.

The stockholders of the company passed a vote at the last annual meeting authorizing the directors to avail themselves of a law recently passed by the Michigan legislature, permitting Michigan mining companies if authorized by a vote of their directors, to subscribe for, purchase and be interested in the stock of any other company formed for mining, smelting or manufacturing wholly or at any place other than in the state of Michigan. This statute provides a simple and effective method for rapid development of the mineral lands of the upper peninsula of Michigan; lands, many of which have remained undeveloped for want of capital from the earliest date of copper mining in the state.

Under this vote and in accordance with the statute, we have organized under the laws of Michigan, the Manitou Mining company, of which we own nine-tenths of the stock. The territory controlled by this company amounts to 38,693.55 acres. The Frontenac Copper company has also been organized under the laws of Michigan, to hold the mineral and other lands we purchased from the Central Mining company, the Manice lands and other tracts in Keweenaw county. The territory owned by the Frontenac Copper company covers 22,268.50 acres; we hold the whole stock of this company.

We are exploring with diamond drills, a part of the lands of Frontenac and Manitou companies to fix the position of the various copper-bearing lodes which cross them. On the Deleware property (now Manitou) we are drifting from the bottom of a shaft 100 feet deep on the Montreal Amygdaloid; the showing of copper in this vein is fair. We have located thus far the Calumet conglomerate, the Osceola amygdaloid and the Kearsarge conglomerate on this property.

We have continued the active exploration of the "Superior" mine, of which we hold the option on 51 per cent of the stock until August 31, 1906. We have secured an extension of this option until December 31, 1906, and hope by that time to have sufficient information as to its probable value to come to a decision regarding it. We have spent thus far $42,000.00 in exploring that property. The "Superior" has 400 acres.

For $25,000.00 we have secured an option on the Nonesuch mine in Ontonagon county, which expires in June, 1907. The payment was based upon preliminary tests of milling the rock from the copper bearing belt of that mine. The "Nonesuch" has 640 acres. We have obtained an option on the majority of the shares of the Gratiot Mining company, organized under the laws of Maine. This mine is on the extension of the Kearsarge lode, north of Mohawk; it has a probable length on the line of the Kearsarge lode of 5,960 feet to a depth on the slope of 2,540 feet. The "Gratiot" has 600 acres.

We have taken an option on the land of the New Jersey Mining company, which runs for two years, and contains 720 acres on the mineral belt and 1,540 acres south of Lac LaBelle. We have taken options on other parcels of land containing approximately 2,000 acres on the mineral belt, which are more or less surrounded by the present holdings of the Manitou and Frontenac companies.

We have also taken options on 51 per cent of the stock of the Caldwell Copper company and of the La Salle Copper company, both having two years to run. The Caldwell Copper company controls 520 acres and the La Salle Copper company 840 acres next to the property of the Tecumseh Mining company.

We have paid for the lands of the Frontenac Copper company and the Manitou Mining company $704,949.24.

For explorations on the "Superior"..... $42,000
For an option on the New Jersey..... 10,000
For an option on the Nonesuch..... 25,000

Should we exercise our options for the purchase of the New Jersey, Nonesuch, and the control of the Superior, Caldwell, Gratiot, and other options, there remains to be paid $1,555,000. The accompanying sketch map shows the position of our new purchases.

The purchase of some of these properties has given us a large supply of timber and we hope in time to find producing mines which may materially add to the output of the Calumet & Hecla. For these purchases and their development the directors have laid aside, as a "Development Fund," the sum of $2,000,000 which has been increased by $750,000 since April 30, 1906.

It will be seen by this report that the statement of Assets and Liabilities that during the past year we have spent large sums for the purchase of new properties and planned for the expenditure of important sums to develop them. Large outlays will also be made during the coming year at the smelting works and shops, in equipping the Calumet & Hecla and Torch Lake Railroad and in broadening its guage, in remodelling a part of the Hecla mill, in duplicating our water supply from the Lake Superior station, in erecting a foundry, completing the electric power plant and distributing electric power. All this is needed to carry on the mine with economy while working on its present scale.

The expenditures of the Aid Fund during the fiscal year amounted to $50,927.60. The value of the Aid Fund at cost is $115,403.89.

For the Directors,
ALEXANDER AGASSIZ, President.

STATEMENT OF ASSETS AND LIABILITIES

ASSETS

Cash at Mine Office.....	$ 120,256.72
Cash at New York Office	15,000.00

Cash at Boston Office, Exchange, Copper at 18 cents per pound and mineral at 7 cents per pound	7,817,994.04
Bills receivable at Boston and mine	1,140,121.76
Development and Equipment Fund	1,827,544.03
Insurance Fund	990,858.68
Employees' Aid Fund	4,906.18
	$11,916,681.41

LIABILITIES

Drafts in transit	$ 39,481.35
Bills and accounts payable at Boston and mine	370,380.76
Mill extension, contracts for machinery, changes at smelting works, foundry, widening the R. R. Gauge, Lake Superior water works	878,000.00
Balance	$10,629,819.30

Since the establishment of the Development and Equipment Fund there has been expended from it in exploration and development of the Manitou Mining company, Superior Copper company, New Jersey Mining company, Frontenac Copper company, Dana Lands, Manice Lands, Nonesuch mine and Gratiot Mining company, $184,859.33.

The above balance of the Development and Equipment Fund, (i. e.,) $1,827,544.03, is invested as follows: In various special investments, $1,486,718.72. In cash and in banks and trust companies, ... $340,825.31

$1,827,544.03

The Insurance Fund, (i. e.,) $990,858.68 is invested as follows:

In various special investments	$968,145.42
In cash in banks and trust companies	22,713.26
	$990,858.68

The earning power of the company applicable for dividends was never so great as at the present time. Of course, the present high price for copper is largely responsible for this excellent condition of affairs.

A few years' comparison follows:

	1906.	1905.	1904.	1903.
Cash and copper	$7,953,251	$6,444,180	$6,070,918	$6,118.435
Notes and bills receivable	1,140,122	590,212	451,521	509,584
Insurance Fund	990,858			

	1906.	1905.	1904.	1903.
Development and equipment Fund (invested)	1,827,544	938,025	763,899	606,878
Employees Aid Fund...	4,906			
	$11,916,681	$8,172,417	$7,286,338	$7,234,878

After distributing $7,000,000 to stockholders in dividends and paying the cost of all extraordinary work the 1905-6 treasury surplus was increased $3,744,264. When it is remembered that this splendid gain was made on an 18-cent copper market, the significance of a 25-cent copper market becomes all the more apparent. And inasmuch as the Company is now making 100,000,000 pounds of copper annually, its earning power per share, through the modest capitalization of the Company—100,000 shares—becomes peculiarly interesting and especially so to stockholders. The advance of each cent per pound in the price of copper means a net gain to the Company of $1,000,000 and the equivalent of $10 for each share of stock. The decline of each cent per pound results in a loss per share at the same ratio.

In regard to the growth and development of the Calumet & Hecla, I quote the following which appears in my previous report: "The mine has been vigorously and continuously operated since 1866 and during its natural period produced upwards of 1,800,000,000 pounds of as good a brand of copper as there is made. Besides, the company has reclaimed a goodly portion of the wilderness and built thereon, one of the finest mine locations of which there is any record. In producing this enormous amount of copper, something like 35,000,000 or 40,000,000 of tons of rock must have been mined and treated. When it is remembered that every ton represents 12 cubic feet, a faint idea may be realized regarding the vast inroads that have been wrought in the company's mineralized conglomerate belt. Still in spite of such gigantic results, the management has succeeded in maintaining the usual amount of ground reserves and even adding a little to them from year to year.

The same successful policy of operating the property on a scale somewhat commensurate with its possibilities and taking out the best there is in it is being fully maintained and will continue to be in the future the same as in the past, only in a greater degree. When the limit may be reached, the capacity of the company's properties and the efficiency of the plants brought up to the point aimed at by the management, must be judged by the achievements of the past. The fact that in the recent copper boom, the stock of the Calumet & Hecla sold for $1,000 per share representing a valuation of $100,000,000 for the property naturally lends interest to the history of the Company. I arrived in Houghton County in the spring of 1866 before any organized work had been started to open up and develop either of the properties now included in the Calumet & Hecla mine and except for about eight months spent in Marquette County, have lived in

Houghton County ever since. I distinctly remember when Calumet Mine shares sold for one dollar each and Hecla shares sold at $5 each. I have likewise seen, as everybody could who wished to, the shares of the Company sell for $1,000 each. For 35 years, I have lived within a stone's throw, so to speak, of its main workings and have been a constant witness of its remarkable growth. When the conglomerate was first opened, and for a considerable time afterwards, the number of people who believed the enrichment anything more than a mere pocket that would soon give out, was small. There were a few, however, who had unbounded faith in the continuity of its values with depth and backed it with all the money and resources they could then demand. That they managed to carry the struggling enterprise to a successful issue is now evident enough. Moreover, with the assistance of others, they succeeded in building it up into the most successful copper mine on the globe.

Mr. Walter Fitch was recently appointed general superintendent of the Calumet & Hecla Mining Company. The appointment is considered an excellent one, as Mr. Fitch is classed among the most successful mine managers in the country.

Mr. John Knox succeeds Mr. J. B. Risque, resigned, as underground superintendent of the Calumet & Hecla mine. Mr. Knox is a graduate of the Michigan College of Mines. For several years he was employed as engineer at the Trimountain when that property was in the state of development. Mr. Knox has technical training and experience and is considered a competent man.

We give below the high and low prices of the stock, the total dividends, and the output in pounds of ingot copper for every year since the consolidation of the Calumet and Hecla companies to the present:

Calendar Year.	Low.	High.	Dividends.	Output in Pounds Ingot Copper.
1870	61	135		14,031,584
1871	89¼	165	$ 900,000	16,222,590
1872	95¾	164½	2,400,000	16,162,183
1873	101½	164	2,000,000	18,848,265
1874	119	145½	1,600,000	20,125,225
1875	139½	164¾	1,600,000	21,473,954
1876	160½	175	1,600,000	21,690,732
1877	162½	190	1,600,000	23,568,468
1878	174¾	185	1,600,000	25,253,128
1879	170	295	1,600,000	26,270,943
1880	200	260	2,500,000	31,675,239
1881	201	258¾	2,000,000	31,361,781
1882	231	255	2,000,000	32,053,539
1883	230	253	2,000,000	33,125,045
1884	124	240	800,000	40,473,585

Calendar Year.	Low.	High.	Dividends.	Output in Pounds Ingot Copper.
1885	135	225	1,700,000	47,247,990
1886	210	231	1,500,000	48,641,815
1887	175	223	1,000,000	51,163,626
1888	190	234	2,000,000	42,345,451
1889	199	299½	1,500,000	51,944,207
1890	240	323	2,000,000	51,986,745
1891	240	280	2,000,000	60,576,996
1892	258	300	2,000,000	56,485,413
1893	247	320	2,000,000	60,427,913
1894	269½	302	1,500,000	61,324,626
1895	280	330	2,000,000	62,466,414
1896	295	335	2,500,000	85,552,756
1897	326	495	4,000,000	92,475,595
1898	489	650	5,000,000	83,920,000
1899	635	895	10,000,000	87,758,000
1900	695	840	7,000,000	89,096,000
1901	535	860	5,500,000	72,652,000
1902	420	650	2,500,000	79,964,000
1903	400	551	3,500,000	76,632,912
1904	435	700	4,000,000	76,620,290
1905	601	720	5,000,000	85,644,800
1906	675	900	7,000,000	101,052,000
			$99,400,000	1,898,314,810

Until recent years, the company confined its operations to mining the famous Conglomerate lode from which all dividends in the past have been made, and paid to stockholders.

A year or two ago, however, the company succeeded in buying some lands in Keweenaw County including the Delaware and other mining locations. Delaware had been worked in early times and hundreds of thousands of dollars spent in the property, but it proved a financial failure. For 30 years or more, Keweenaw County has been practically dead. Calumet & Hecla people investigated the Delaware property and are convinced that it contains profitable values and consequently, have planned to open the property and develop it into a modern mine. The work will involve an expenditure of hundreds of thousands of dollars, perhaps millions. From time to time thousands of men will find employment at good wages in the work. Shafts are already underway down into the formation and its development is proceeding on up-to-date methods. A mechanical equipment has been installed, which is adequate for present requirements. It will be added to and strengthend as needed.

Further south adjoining the Mohawk, lies the Gratoit, which Calumet & Hecla people are also developing through two modern shafts. The

lands comprising this mine consist of 600 acres carrying the northern continuation of the Kearsarge amygdaloid formation. The outlook for Gratoit is exceedingly promising and the present developments show first-rate copper bearing rock. No. 1 shaft has now been started for six weeks and is at a depth of 65 feet with a good showing of copper. The surface equipment is in very fine shape. Shaft No. 2 has been sunk to a depth of 250 feet and also has a fine showing or copper values. At this shaft, a cross cut has been started at a depth of 215 feet. The prospects for the future of the Gratoit are indeed very flattering.

South of Portage Lake, the company is developing the Superior mine referred to elsewhere in this report. In Ontonagon county, the company succeeded in optioning the old Nonesuch property, which had been lying idle for years. Like some of the other mines, it is designed to give a fresh trial and opened up if feasible. Nonesuch was worked in early days when mining methods were crude and transportation facilities limited. Considerable money was spent in the undertaking, but it turned out a financial failure. Here again, Calumet & Hecla made an intelligent practical investigation of the property and feel convinced that if opened up and developed on practical lines and worked on up-to-date methods, it can be made into a successful mining enterprise. The undertaking will furnish employment for hundreds of men at good wages. More recently still, the company purchased a controlling interest in the La Salle Copper Company, referred to elsewhere in this volume, which includes the Tecumseh, Caldwell and other properties. While these are new organizations, many of the properties are old concerns that had been tried in the past, but under the methods then in vogue, could not be made to pay and were abandoned. Altogether Calumet & Hecla has planned to spend millions of dollars in the development and equipment of new propositions. The work involved in the undertakings will really mean a reclaiming of the wilderness. Where is now primeval forest, or a second growth one, vigorous mining will be going on giving hundreds of men steady employment, and thriving towns will spring up. Calumet & Hecla Mining company is among the best in the world, has practically unlimited financial credit, knows the business thoroughly, does it right and will undoubtedly succeed, where other people, less fortunate, failed. Most of the mineral formations contained in these properties are but medium or low grade and can only be made to pay expenses by working them on a big scale and on up-to-date methods, such as Calumet & Hecla plans to operate them. And it would be practically useless for any company to attempt working them, with the remotest hope of being successful, unless it has a rich treasury or a strong financial backing.

TAMARACK MINING COMPANY.

Capital stock, One Million, Five Hundred Thousand Dollars. In Sixty Thousand Shares of $25 Each.

Officers: President, A. S. Bigelow; secretary-treasurer, W. J. Ladd; general superintendent, Norman W. Haire; superintendent, W. J. Uren; assistant superintendent, John T. Been; enginer, ————————; Wm. M. Harris, clerk.

Mining captains: Nos. 1 and 2 shafts, Edward Waters; No. 5 shaft, John Rowe; No. 3 shaft, or North Tamarack, Wm. Rosevear; stamp mill superintendent, A. L. Burgan.

Tamarack mine is on its feet again, working away with renewed vigor and doing well. Barring accidents, 1907 promises to be one of the very best years in the history of the company if not a record breaker. Of course, this will be due largely to the high price prevailing for copper. While shafts 1, 2, and 5 were closed down, owing to the fire raging underground, the surface plants were overhauled and put in thorough repair and the whole mechanical equipment is running nicely and doing first-rate service. Upon the whole, Tamarack mine has not looked so well in years as it does at the present time, nor was it in position to furnish a better product at moderate operating costs. The method in use for taking out the product has been modified and the condition of the underground department much improved. During the past year or two the lode in the deepest openings, and particularly in the ground contributary to No. 3 shaft has been changing for the better both as regards its uniformity in character and enrichment. The stamp mill is reflecting the improvement where it counts. Though the old mine was on fire for a year and considerable caving occurred in the upper levels, there is still a great deal of accessible standing ground that will make fine stopes. The rock output and product of copper will soon reach the average of the mine and be taken out at reduced operating costs.

The property is very ably managed and a great deal of new work has been done recently in one place and another that resulted in strengthening the position of the mine all over. Already, the benefits arising from the improvements are beginning to show up in the cost sheet.

Tamarack is a very deep level proposition, having no lode outcrop and consequntly, an expensive one to operate, still the mine has been a fine business enterprise. The company was organized in the year 1881 and returned its first product of copper in 1886 which was 3,646,517 pounds. It was sold for 11 1-16 cents per pound. Since the beginning of operations the company has produced including the product of 1906, 302,000,000 pounds of copper and paid in dividends $9,180,000 or $153 per share on its 60,000 shares of stock and over six times its capitalization. In view of the fact that all kinds of disaster were predicted for the mine when it started, the success achieved speaks well for the judgment and mining insight of the late Capt. John Daniel, who conceived and planned the mine and developed it into one of the most valuable mining enterprises in the Lake district. And Tamarack is not done yet. I am of the opinion that the mine will pay in dividends many times the amount already distributed to stockholders.

During 1906 the average number of men employed was 1,238 and the average number of power drills operated, 53.9.

SUMMARY OF OPENING WORK.

Total shaft sinking	90.0 feet.
Total drifting on Conglomerate	2,572.5 feet.
Total drifting on Amygdaloid	26.0 feet.
Total crosscutting	860.0 feet.
Total sinking on winzes	1,083.5 feet.
Total openings in all classifications	4,632.0 feet.

COMPARATIVE RESULTS FOR 1905 AND 1906.

	1905.	1906.
Tons rock stamped	750,120	389,680
Pounds mineral obtained	24,780,945	14,779,809
Percentage refined copper in mineral	63.855	66.53
Pounds refined copper per ton of rock stamped	21.1	25.2
Product fine copper, pounds	15,824,008	9,832,644
Cost per pound at mine, excluding construction	11.31c	12.77c
Cost per pound construction	0.55c	0.92c
Cost per pound of smelting, freights, eastern expenses, interest, commissions and all other charges	1.51c	1.60c
Total cost per pound of refined copper	13.37c	15.29c
Cost of mining and stamping per ton of rock stamped	$2.39	$3.22
Cost of stamping per ton	22.27c	29.40c

It may be worthy of note that the yield of fine copper per ton of rock treated in 1906 was 25.2 pounds as against 21.1 pounds in 1905.

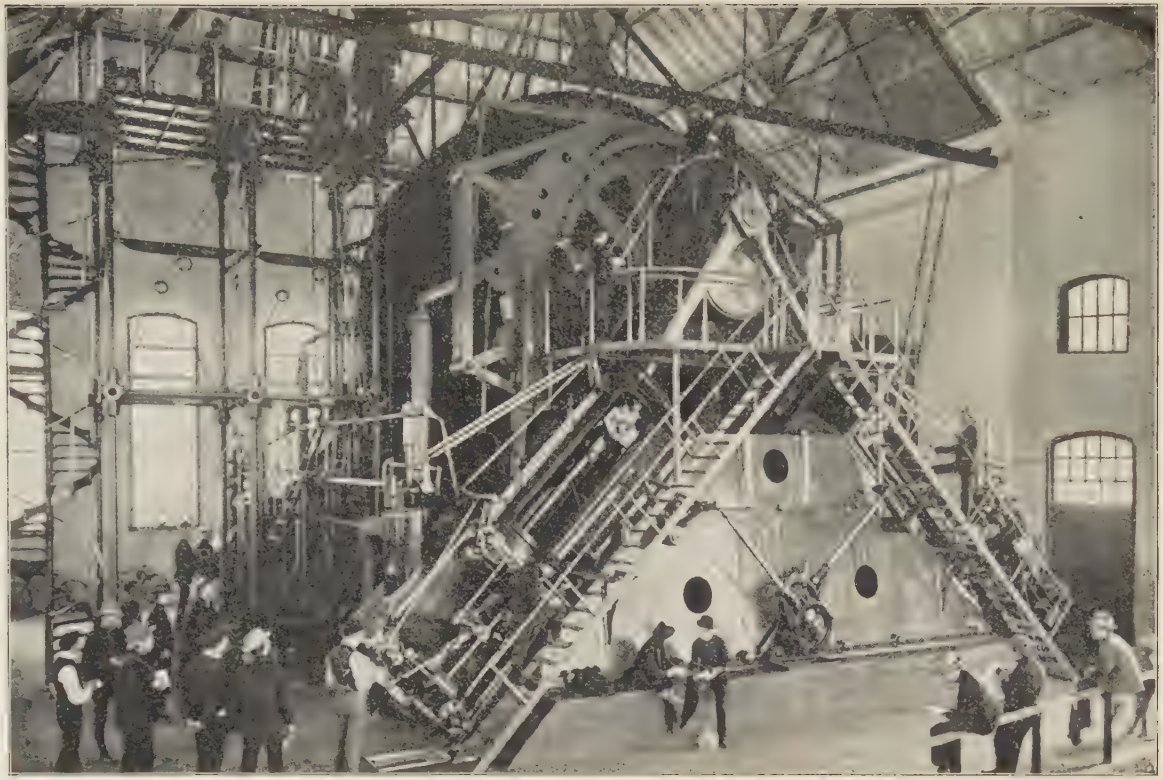
Assets and Liabilities for 1905 and 1906:

	1905.	1906.
Assets, including copper sold, but not paid for	$1,949,267.94	$2,010,140.17
Liabilities, including advances on copper	1,100,678.57	1,047,920.32
Balance of assets December 31	$848,589.37	$962,219.85

Extracts from General Manager Haire's report:

NO. 1 SHAFT.

On account of the fire referred to in our last year's report no mining work was done here after January 11, 1906. Since that date, on account of its strong up-cast, this shaft has been used as a chimney for the whole mine. The fire is still burning, but is now confined to old stopes contiguous to this shaft. For the past three months the gas and smoke have been slowly diminishing in volume. The fire does not appreciably inter-



REPORTING ON POWER PLANTS AT TAMARACK NO. 5 HOIST

fere with the working of any part of the mine except the Osceola Amygdaloid lode. On account of the caving of the old stopes years ago the present seat of the fire cannot be reached, consequently we will let it burn out.

NO. 2 SHAFT.

The fire which started on the 22nd level of No. 2 on the 11th of January, 1906, was fully described in our last annual report.

As soon as the daily normal production is reached upon the conglomerate we intend to resume the opening of new ground on the 20th, 21st and other levels of the Osceola Amygdaloid lode.

NO. 5 SHAFT.

This shaft is connected through its lower openings with No. 2. Hence, on account of the fire in No. 2, this part of the mine was operated only eight months. Even during the period of operation the product was considerably curtailed on account of our being obliged to handle at this point not only the water naturally draining here, but also all of the drainage from Nos. 1 and 2. The water from these two shafts ran down to the bottom of No. 5, from which it was hoisted over 5,000 feet to the surface by the use of iron bailers specially constructed at our shops for this purpose. The capacity of each bailer is 2,000 gallons. Upon a complete resumption of operations in No. 1 and 2, No. 5 will be relieved of the greater part of this expense for bailing.

NO. 3 SHAFT.

On December 31, 1906, this shaft had reached a perpendicular depth of 5,229 feet, or 51 feet less than a mile. It was the chief mainstay of the whole mine, in a year of disaster at every other point. For four months it was the only producing shaft, and for eight months by far the chief producer. From its product was paid a large portion of the enormous expense caused by the fire, as well as the dividends and additions to the surplus. The percentage of mineral and refined copper in the rock was higher than for years past.

The method of tramming at Tamarack has always been a mooted question. Mechanical haulage was placed in the cross-cuts some years ago, where it gave excellent satisfaction, but it was never tried elsewhere. Air was used for power, and the car was attached to an endless rope. On account of the great cost of tramming from the remote boundaries of the mine, we determined to extend to the drifts the haulage system used in the cross-cuts. We selected the 15th level south from this shaft, in which to try the experiment. It is 1,600 feet from the shaft to the south end of the drift. The track was levelled up and straightened, and all sharp angles blasted out. At all sharp angles the rope is made to run in sheaves. The power is supplied by a small steam engine. The installation was completed about October 15, and has proved a complete success. By the use of three additional men we have more than trebled

the whole output of rock from the 15th level. After four months' trial we have yet to record the first accident. We have since installed the same system with equal success in the 31st level of No. 5. By the middle of the present year we intend to have mechanical haulage installed in all of the longer levels of Nos. 2, 3 and 5. We then look for favorable results from an increase of product and a decrease in the cost of tramming per ton. The credit for the successful results of this scheme is due to our general and assistant superintendents. Their skill in working out plan and persistency in overcoming every obstacle, are worthy of our commendation.

GENERAL REMARKS.

While the results of the year have been poor, they are not altogether bad. If the decreased product had been caused by a steady depreciation in the quality of the rock there would be just cause for misgivings in relation to future prospects. As it is, we should be much encouraged by the fact that under the most adverse circumstances the mine produced nearly 10,000,000 pounds of ingot copper. Better than this is also the fact that for the past two years all new openings have shown steady improvement in quality and extent. We shall continue to drive the new drifts during 1907 with all possible dispatch.

A department for the purchase of supplies for all our mines has been established at the general office in Houghton. Mr. J. T. Reeder, formerly clerk of the Tamarack, has been appointed purchasing agent. He has already organized an efficient office force and a method of doing business which already works with the regularity of an old-established system.

Early in the year Mr. John T. Been was advanced from the position of chief engineer to that of assistant superintendent of the Tamarack. About the same time Mr. William M. Harris was promoted from the position of bookkeeper to that of chief clerk. Mr. C. D. Hohl, instructor in the Michigan College of Mines, was offered, and has accepted, the position of chief engineer. The results have fully justified the management in making the above appointments.

In December Capt. Thomas Maslin, who was for many years chief mining captain of Tamarack, was compelled to resign on account of failing health. In all his long years of faithful service the interests of the Tamarack were always paramount in his mind. Its past success was in a large measure due to his indomitable energy.

Except as above, the general official corps is the same as last year. We are all under personal obligations to Mr. W. J. Uren, our general superintendent, and all other general officers whose unfailing courage under most trying ordeals carried Tamarack through the greatest crisis in its history.

Captain Maslin did not live long after his retirement to enjoy the well earned fruits of his labor. In the evening of the 11th day of

April, 1907, just four months and eleven days after retirement, Capt. Maslin passed to his final rest. The death of Captain Maslin marked the passing of one of the old school of Cornish miners who have done a great deal towards developing and carrying to a successful issue the copper and iron mines of the Lake Superior region and also the most successfully operated mines of every description all over the world. Captain Maslin was a very capable mining man, energetic and progressive and enjoyed alike the confidence and respect of employer and employee.

CENTENNIAL MINING COMPANY.

Office, 60 State Street, Boston.

Capital stock, Two Million Five Hundred Thousand Dollars, In One Hundred Thousand Shares of $25 Each. $22.25 Per Share Paid In.

President, H. F. Fay; Directors, A. Agassiz, F. L. Higginson, F. W Hunnewell, Quincy A. Shaw, Jr.; R. L. Agassiz, H. F. Fay, W. L. Frost, Geo. G. Endicott, James MacNaughton of Michigan; Secretary and Treasurer, Geo. G. Endicott.

General manager, James MacNaughton, Calumet, Michigan.

Transfer Office, 60 State Street, Boston.

Though a producer of copper, Centennial is still a developing, struggling proposition with considerable construction and development ahead before the property can be rounded out and put into up-to-date condition for economical mining on a large scale. The property is splendidly located and well thought of and the general opinion is that it will develop into a fine mine and a profitable business enterprise.

In 1906 the company employed on an average 340 men and operated 27 power drills. 209 feet of shafts were sunk and 2,134½ feet of drifting extended on the lode. 166,000 tons of rock was treated at the stamp mill, which yielded 3,436,735 pounds of mineral and 2,253,015 pounds of refined copper, or just 13½ pounds to the ton treated. To be sure, this is low grade rock, but it should not be taken for an average of what the mine will return when further opened up and developed. Much of the rock treated came from advance openings, which happened to be a little too good for the poor dump with copper selling at 19½ cents per pound. The property is splendidly located and adjoins the Calumet & Hecla on the north and South Kearsarge and Wolverine mines on the south and west. Lands owned consists of the whole of Section 12 and a triangular corner of 20 acres adjoining the southeast corner of its main tract. Acreage is 660 acres carrying the Calumet Conglomerate, Osceola and Kearsarge amygdaloid lodes for over a mile in length on strike line of the formations. Two shafts are sunk on the Kearsarge lode, which the company develops and mines.

At the annual meeting of the Centennial Mining company, the report of the year's operations as submitted by the treasurer compares as follows:

	1906.	1905.
Balance January 1	$263,174	$ 95,951
Receipts:		
Assessment	10,536	353,892
Centennnial Heights Towsite	109	90
Sale of stock		
Sale of copper	429,515	230,129
Sale, rights and way deed	1,000	
Total	$782,940	$680,062
Payments:		
Mining expenses	$308,147	$257,622
Smelting and all other expenses	58,817	42,762
Construction and equipments	75,665	47,892
Total payments	$442,630	$348,283
Balance, December 31	$340,310	$331,770

Inventories on hand January 1 compare as follows:

	1907.	1906.
Cash	$231,794	$263,175
Copper sold	76,499	49,229
Fuel	31,616	36,661
Supplies	28,897	11,326
Accounts receivable	8,081	7,715
Total	$376,887	$368,106
Less accounts payable	36,577	36,326
Inventory	$340,310	$331,780

Annual production of copper and price received compares as follows:

	1906.	1905.
Pounds refined copper	2,253,015	1,446,584
Received for copper	19.5078c	15.908c

Superintendent Chynoweth says:

The annual report of operations for the year ending Dec. 31, 1906, is herewith submitted:

Total openings, 2,437½; total stopings, 12,741 fathoms.

SUMMARY OF RESULTS.

	Tons.
Rock broken	192,866
Rock discarded	26,866
Percentage discarded	13,930
Rock treated	166,000

	Pounds
Mineral produced	3,436,735
Percentage of mineral in rock treated	.01035
Mineral per ton rock treated	20.70
Refined copper	2,436,735
Percentage mineral in rock treated	.00000
Percentage refined copper in mineral	.65557
Percentage refined copper in rock treated	.00679
Refined copper per ton rock treated	13.58

The detail of the construction and equipment work at mine and mill is shown in the mine report to the treasurer.

No. 1 shaft is now 30 feet below the 31st level and No. 2 shaft has reached the 27th level and is complete wiith one skip road to the 25th level.

The figures given above show the average value of the lode during the past year more accurately than any statement I can make concerning it, stopes having been operated at all the levels mentioned above. The 30th level, which was so encouraging a year ago, proved to be disappointing, as the copper contents have been very irregular.

The new compressor referred to in my last report, was four months late in delivery and this seriously checked our opening work, because in order to keep one head running continuously we were obliged to use most of the drills for stoping. From Oct. 1, 1906, to Jan. 1, 1907, only 348 feet of new ground was opened.

The steel rockhouse at the No. 2 shaft is almost completed, and the big hoist is installed and ready for operation and the compressor will be ready to go into commission in a very short time. When all this work is completed and No. 2 shaft is in full operation, we shall be able to draw a larger percentage of rock from the openings north of this shaft, the copper contents of which are of greater value than the ground tributary to No. 1 shaft. Therefore, I think the mine will make a better record during the coming year than it did in 1906.

I take this opportunity of thanking my associates for their faithful co-operation throughout the year.

Boston—There was represented either by proxy or in person 71,703 shares out of a total outstanding of 90,000 shares at the Centennial Mining company's annual meeting today.

Resolutions were offered and passed confirming the sale of the Centennial millsite to the Calumet & Hecla Mining company, and two merely formal amendations were made to the by-laws of the company; providing for the offices of vice-president and secretary and treasurer. Such provision did not previously exist.

The Calumet & Hecla representatives voted only a few shares, just enough to give them legal standing as shareholders.

On the 1st of April, 1907, Capt. James Chynoweth resigned the position of superintendent of the property and Mr. James McNaughton succeeded him as general manager.

WOLVERINE MINE

President, Joseph E. Gay; secretary-treasurer, John R. Stanton; agent, Fred Smith; mining captain, William Pollard; clerk, Chas. Noetzel; main office, 15 William St., New York; mine office, Kearsarge, Mich.

Wolverine mine is capitalized at $1,600,000 divided into 60,000 shares of a par value of $25.00 each. The amount of cash paid in on the capital stock is $780,000. The first disbursement to stockholders was made in 1898, since which the aggregate amount received by them including the dividend of $10 per share paid April 1, 1907, is $4,010,000 and $75 per share.

Wolverine forms one of the solid, substantial mining enterprises of the copper district and is well and widely known. Reference to its dividend record shows that disbursements to stockholders have been steady and continuous for years and that recent achievements in that line have been rarely equalled. As a mark of distinction, the mine is often referred to as the "Little Calumet & Hecla of the Lake district." For its size, Wolverine is the richest and most remarkable amygdaloid mine in the Lake district and the results of 1906 were distinctly the most successful year in its history. Of course, the substantial prices received for copper accounts largely for the company's splendid net earnings. And 1907 will prove a better year still for the price of copper, the metal, will average higher. The value of a copper mine depends altogether more upon the market price of the metal than upon any other condition. But the mine is splendidly managed all over. Every department is in first class condition and rendering the very best of service. Efficiency is reflected everywhere. There is not a single thing that seems to be neglected and every seeming need is anticipated and provided for in season. It is quite true that the mine as a whole is concentrated; has reached its maximum capacity and is equipped with a mechanical plant practically good for the remainder of its life of activity. However, many wonderful things will happen before the last skip of rock is hoisted out of this "Little Calumet & Hecla" and the number of its years will be many more than some authorities imagine. The mine is situated about one mile and one-half north of the town of Calumet in Town 56, Range 32; adjoins South Kearsarge on the north, and North Kearsarge on the south and has 320 acres of land carrying the Kearsarge amygdaloid and other mineral belts. Kearsarge amygdaloid develops values in Wolverine equivalent to about 30 pounds of copper per ton of rock treated. The company's fiscal year ends June 30. In the last fiscal year ending June 30, 1906, the company treated at its stamp mill 341,820 tons of rock, which yielded 9,681,706 pounds of refined copper. The copper was made for the remarkably low price of 6.76 cents per pound including construction charges.

The following tabulation gives comparative results, costs and profits for the past three fiscal year:

	1906	1905	1904
Pounds of fine copper produced	9,681,706	9,729,971	9,260,386
Tons of rock stamped	341,820	321,813	314,091
Pounds copper per ton rock	28.32	30.23	29.61
Operating expense per ton rock	$1.54	$1.88	$1.91
Cost per ton of copper (cents)	6.50	6.22	6.46
Average price per lb. received (cents)	17.17	13.83	12.75
Net earnings per share	$16.79	$12.35	$9.28

Wolverine's product of refined copper for the calender year 1906 was 9,548,123 pounds.

It will be noted that the richness of Wolverine rock is being well maintained from year to year. At the beginning, its rock yielded an average of only nineteen pounds to the ton.

The following comparison of dividends during the past five years may be interesting: 1901-2, $240,000; 1902-3, $270,000; 1903-4, $390,000; 1904-5, $540,000; 1905-6, $840,000; 1906-7, $1,140,000.

The company employs about 420 men and operates 30 machine drills. The mine is opened and worked through three working shafts, Nos. 2, 3 and 4, sunk in the lode at an angle of forty-one degrees from the perpendicular. Shafts are substantial and in the best condition. No. 2 shaft is 1,700 feet deep and bottomed there. It is used only for lowering and lifting men and supplies. In January, 1907, No. 3 was 3,000 feet deep and down to the 32nd level, No. 4 was 2,800 feet deep and down to the 32nd level. In the lower workings, levels are one hundred feet apart, and from 75 to 80 feet apart in the upper workings. All three shafts are connected underground on different levels and various other places. Air circulates freely through underground workings, making ventilation good. Wolverine is a comfortable mine and men like to work in it. It is in excellent physical condition and opened up for years ahead. Openings in the lode are 3,000 feet in length and about sixteen feet wide. Deepest point penetrated carries values fully as good as the average of the mine. The rock output comes from stopes located practically all over the mine, and hoisted through Nos. 3 and 4 shafts. Openings into new ground average about 600 feet a month, and the average ground reserves are fully maintained. Mine began career by returning from sixteen to eighteen pounds of copper per ton of rock; then it rose to twenty, followed by gradual steps to thirty. The mechanical equipment is of the best, powerful, highly efficient and economically operated. Power and machinery houses are substantially built and generally of stone and conveniently located for direct work and the best results. Each shaft has a separate hoisting plant and shaft rock house equipment. Skips counterbalance in shafts carrying four tons of rock to a trip and dump automatically on

grizzles in the rockhouse. A new hoisting engine for No. 4 shaft has been ordered and will be installed this summer and that will make the equipment practically complete.

The Wolverine has a new stamp mill located near the mouth of the Tobacco river, on Traverse Bay, Lake Superior. The structure is built of steel on stone foundation, 180 feet by 206 feet in dimensions. It is equipped with two Nordberg heads striking about 106 blows a minute, and the best machinery known for washing and saving copper and works satisfactorily. Daily capacity of the mill is about 1,050 tons rock. The mill is practically new, one of the best in the district and connected with the mine by the Mohawk and Traverse Bay railroad. Rock is being hauled by the Mineral Range Railroad company. The mill and mine locations are provided with comfortable dwellings for the employes and rented to them on very liberal terms. Order and system prevails all over the property and the company's affairs are transacted with efficiency and exacting knowledge. The buildings and locations are lighted by electricity.

ARCADIAN COPPER COMPANY

Arcadian is still an exploring proposition and the work of proving up the property, or rather, the work of looking for a profitable copper bearing lode goes right ahead. Progress has been steady and continuous and considerable headway has been made. The work is conducted in a practical, business like way. The management has succeeded in finding a lode carrying copper, but whether in commercial quantities can only be determined, perhaps by sinking further and investigating the formation at greater depth. The management is experienced, practical and knows what should be done for the best interest of the stockholders and the property.

The new shaft referred to in my previous report has been continued down to a depth of 200 feet. From this point the bulk of exploring work has been carried on. In view of recent disclosures made by the diamond drill in neighboring properties, at much greater depth than Arcadian shaft has attained, perhaps it would have been a better plan to have sunk the shaft a few hundred feet deeper, while the work was underway, and conducted the work of exploration from greater depth. However, the work of running the shaft further down can be started up any time the management may deem it necessary to do so. The lode in which the shaft is sunk is fairly healthy and shows up some bars of copper bearing rock, but not in sufficient quantities to pay for mining. What values it may contain at greater depth or in some other part of the property is anybody's guess. From the bottom of the shaft, a crosscut was driven east to another formation thought by many to be a concentration of the Baltic lode. In some particulars, this formation resembles the Baltic lode. It does not, however, contain such rich values

as the Baltic lode south of Portage Lake, still it carries copper and I have seen some nice pieces of copper rock that came from there. Drifting is still going on in this lode. About 20 men are employed and a 15-drill capacity Rand compressor is operated. Opening work in 1906 consisted of shaft sinking 150 feet; crosscutting 300 feet and drifting in the lode 150 feet. Additions to equipment included an engine and boiler house, changing house for men and a small shaft house. Equipment is in good running order. Capt. Otto Lieber has succeeded Capt. Thomas Carlyon as mining captain. Captain Lieber is a capable man with a valuable experience and he knows mining and is moreover a good judge of vein rock.

Before closing this article, I wish to quote a sentence from my previous report and refer briefly to the transfer of 800 acres of land from the Arcadian company to the Quincy company. The sentence reads: "There are many people on the Lake, who believe the Arcadian to contain important values and that they will be found and mined." Little did I think when writing this sentence that within one year, the Quincy people would pay $750,000 for 800 acres of Arcadian land. Still I was not surprised when I learned the deal was closed for I happened to be among the number who believed the land to contain important values, as many people can testify.

There are transactions in which both buyer and seller may claim a bargain and this may be one of them.

Boston.—"There has been some criticism to the effect that Arcadian sold its 800 acres of land to the Quincy Co. at 'bankrupt sale' and it was worth much more to the Quincy than that company paid for it. Regarding this matter an official of the Arcadian says, "It is true the Arcadian Co. sold a valuable piece of ground to the Quincy Company for $750,000. I am not prepared to admit, however, that it was worth more to the Quincy than that company paid for it, and it was worth less to us than we received for it." "The fact of the matter is we wanted to sell and Quincy wanted to buy. Under such conditions it was easy to trade, and both buyer and seller feels that he has obtained a bargain."

"The Arcadian Co. is freed from debt, and is now in a condition to go before its stockholders and ask for more money if it is felt that the present developments warrant exploitation on a larger scale. With a debt of nearly $700,000 staring the stockholders in the face, it would have been next to impossible to get the management to consider any re-financing looking to larger operations.

"We now have 3200 acres of land on the mineral range of Michigan, and if any one will take the time to note carefully the lay of this land, by what properties it is surrounded, etc., he cannot but be convinced that purely as acreage on the mineral zone without any actually demonstrated ore bodies, the stock is worth more than it is selling for."

The financial condition of the Arcadian Mining Company on October 12 was as follows:

Resources—	
Real estate and improvements	$2,494,155.51
Cash, supplies and Accounts Receivable	50,171.92
Profit and loss	1,920,143.97
	$4,464,471.40
Liabilities—	
Capital stock	$3,750,000.00
Floating debt	714,471.40
	$4,464,471.40

As may be seen by the statement, Arcadian had a floating debt of $714,471.40 on the 11th day of October, 1906. The amount received from the Quincy Mining Company for the 800 acres of land sold was sufficient to pay off the debt and leave for operating purposes $35,528.60. And the Arcadian Company still owns approximately 3,200 acres of land, all situated upon the mineral range and including within its borders a large number of lodes, some of them well known, a number of which may yet be demonstrated to carry good copper values; and the directors believe that there is a strong chance of opening up the eastern land of the company veins, which may prove of great value.

Albert C. Burrage, president; Chas D. Burrage, secretary-treasurer; Robert H. Shields, superintendent; Otto Lieber, mining captain. Mine office, Houghton, Mich. Main office, 85 Ames Bldg., Boston, Mass.

RHODE ISLAND COPPER COMPANY.

This is still an exploring proposition situated about midway between the towns of Calumet and Hancock and adjoins the Franklin Junior on the south and La Salle on the north. The mine is described at some length in my previous report and since its publication, no material change has taken place in the physical appearance of the property. In the first half of 1906 the company employed 23 men, drifted on the Pewabic lode 334 feet and drove crosscuts to the extent of 130 feet. During the remainder of the year operations were confined to diamond drilling the property on surface and underground with the hope of locating a lode carrying copper in paying quantity.

With a good many people, Rhode Island is a favorite and while the diamond drilling was in progress, the scene of operations was closely watched by local interests. The work was conducted on practical lines and economically operated. The company has 800 acres of very interesting land centrally located and through which extends the Calumet and Allouez conglomerates; the Osceola and Kearsarge amygdaloids besides

the so-called "East and West" lodes. These are among the most valuable lodes mined in the entire copper district. Recent developments in Franklin Junior to the south and in Tecumseh and Caldwell on the north are important and naturally adds quite materially to the prospective value of Rhode Island.

Following is a modified copy of the company's interesting report for 1906:

TREASURER'S ACCOUNT.

New York, December 12th, 1906.

Statement of Receipts and Expenditures from Jan. 1st., 1906, to December 1st, 1906.

Balance on hand, January 1, 1906	$21,952.36	
Received from interest, etc.	301.12	
Profit on account of sale company stock	12,594.50	
		$34,847.98
Paid for mining and all other expenses		$28,572.33
Balance December 1st, 1906		$ 6,275.65

Acting Superintendent M. M. Dennis writes in part:

KEARSARGE AMYGDALOID LODE.

As stated in last year's report, "the Kearsarge Amygdaloid lode has been located by diamond drill, (hole number one), showing that it would outcrop on the property near the southeast corner of the southwest quarter of Section four, the extent of which, as well as the dip of the lode, is yet to be determined. This means that the lode crosses almost the entire property of eight hundred acres.

The core extracted shows a well defined lode about nineteen feet wide, and carrying an encouraging amount of copper. The showing thus exposed by this small core speaks well for the future of the lode on this property.

While we have drilled three diamond drill holes into the Kearsarge Amygdaloid lode since the one above mentioned, the data thus secured is insufficient to determine, conclusively, the position of the lode, owing to what has been termed a "fault."

The core from the second hole also showed the lode to be mineralized, while the cores from the third and fourth holes did not show copper.

I have recommended drilling a vertical hole to intersect the lode at greater depth where conditions may be found more settled.

From present indications, the Kearsarge lode is offering great possibilities, owing to the results obtained at other mines. Whether it would be productive or not, on this property, cannot be known until it has been thoroughly explored by actual mining. We have, on the property, the necessary hoisting engine for opening up a new shaft, it having been formerly used at No. 1 shaft. I would also recommend a series of cross

section diamond drill holes to be drilled in the territory situated east of Albany and Boston Conglomerate lode, and west of the Kearsarge Amygdaloid lode.

On the fifth inst., we shipped 9,892 pounds of mass and barrel copper to the Quincy Smelting works for treatment.

Our equipment, both on surface and underground, has given entire satisfaction.

Main office, 32 Broadway, New York. Mine office, Hancock, Mich.

William R. Todd, president; W. A. O. Paul, secretary-treasurer; M. M. Dennis, acting superintendent.

ONECO.

The Oneco is a 100,000-share company, organized under Michigan laws in 1899. The property was originally known as the Hungarian more recently, for a short time as the Fitzgerald. The earliest work was done in 1862, when a shaft was put down less than 100 feet. The next work was done in 1899, but it was only limited. Then in 1898, Mr. Fitzgerald financed some exploration before the present company was organized. The property is an extensive one, consisting of 800 acres lying in Sections 2, 3 and 10, Town 55, Range 33. Various copper bearing belts traverse the lands and Mr. Edwin J. Hulbert, discoverer of the famous Calumet Conglomerate, maintains that at least one of them carries substantial values I have read letters written by Mr. Hulbert to Mr. Fitzgerald, president of the Oneco, making his claim. Oneco location is situated east of the channel in which occurs the Calumet & Hecla, Quincy, Osceola, Wolverine and some other successful mines on the north range, but years ago, the feeling was quite general that a lode or lodes carrying important values did exist somewhere in these eastern lands. In 1899-1900, a shaft was sunk in the amygdaloid bed in Oneco to a depth of about 500 feet and some drifting done. Shaft is double compartment with single skip-way. It is well timbered, has been under water ever since and should be in a state of good preservation. The lode opened and investigated was not rich by any means, but it developed some fair seams of copper ground that looked very well. Greater depth and further investigation might reveal better values.

The company did a little exploring work on the property last summer, but did not, so I understand, succeed in finding a lode carrying profitable values. A further trial, however, may bring its reward.

President, W. F. Fitzgerald; treasurer, S. S. Miller; mining captain Joseph Hocking.

OLD COLONY COPPER COMPANY.

Office, 60 State Street, Boston, Mass.

Capital stock, Two Million Five Hundred Thousand Dollars, in One Hundred Thousand Shares of $25 each. $11.00 per share paid in.

Officers: President H. F. Fay; secretary-treasurer, Geo. C. Endicott; James Chynoweth, superintendent.

TO THE STOCKHOLDERS.

Your directors desire to call to your attention to the accompanying report of the Superintendent covering the work done during the year ending November 30, 1906, and to the treasurer's statement giving the receipts and expenditures for the fiscal year ending September 30, 1906, which shows a balance sufficient to meet the expense of considerable additional exploratory work.

FOR THE DIRECTORS.

Boston, December 12, 1906.

H. F. Fay, President.

Superintendent Chynoweth's report of the operations of your company for the year ending November 30, 1906:

Shaft	44	feet.
Drift 7th level south	17	feet.
Crosscut east from above drift	72	feet.
Crosscut west from above drift	68	feet.
Drift north of west crosscut	274	feet.
Drift south of west crosscut	223½	feet.
Total openings	698½	feet.

As you will note from above, the north drift has been extended a distance of 274 feet. This level has disclosed a lode of more promising character than any other opening.

Balance of assets over liabilities Dec. 31, 1906, $16,845.48.

The property of this company is described in my previous report.

MAYFLOWER MINING COMPANY.

Office, 60 State Street, Boston, Mass.

Capital stock, Two Million Five Hundred Thousand Dollars. In One Hundred Thousand Shares of $25 each; $8.00 per share paid in.

Officers: President H. F. Fay; secretary-treasurer, George G. Endicott; James Chynoweth, superintendent.

DIRECTORS' REPORT.

To the stockholders:

In accord with the report to stockholders of March 21, 1906, all operations at the mine were stopped on April 1, 1906, the fuel and supplies on hand were sold and all machinery sold or stored.

During the balance of the year no results from investigations on neighboring lands were of sufficient importance to warrant taking up investigation on your property. On February 5, 1907, there was received for sale of north half of northeast quarter of northeast quarter and lot 1,

all in Section 8, Township 55, Range 32, in Houghton County, Michigan, $35,000, which, with the balance on hand January 1, 1907, as shown in the Treasurer's statement, will provide funds for considerable development work whenever it is deemed advisable.

The annual report of the Mayflower Mining Company for the year ending December 31, 1906, shows a balance on hand of $7,421.07 compared with $11,698 on December 31, 1905, and $32,855 on December 31, 1904.

SOUTH OF PORTAGE LAKE.

COPPER RANGE CONSOLIDATED COMPANY.

This company is a security holdings organization incorporated under the laws of the state of New Jersey.

Capital stock, $38,364,900, in 383,649 shares of $100 each.

President, William A. Paine; secretary-treasurer, Frederic Stanwood. Main office, 26-27 Brazer Building, Boston, Mass.

Copper Range Consolidated has had a remarkable growth and forms one of the solid, substanital mining enterprises of the copper district of Michigan. Though a young organization as age goes, and no more than in its infancy, yet it ranks among the Lake Copper mines second to Calumet & Hecla as a producer of copper and money maker. The company has a vast acreage of land carrying the Baltic lode over five miles in length on the strike line of the formation and in which the mines owned and controlled may be developed and operated on a far larger scale than anything hitherto attempted. Copper Range has been managed with decided success from the start and substantial progress has been made in every department of its workings. The policy outlined and followed by the management has been liberal, progressive and of the kind that lead to big results. Future requirements are anticipated, kept well in the foreground, and provided for in season. The management is up-to-date, among the best going and the affairs of the company are dispatched with distinct efficiency. Every department is running successfully and doing full duty.

From every practical standpoint, 1906 was the banner year in the history of the company. As regards net earnings, however, the success achieved was due in no small degree to the high price received for the product of copper, which was about.....cents per pound. The combined product of rock treated at the Baltic, Champion and Trimountain stamp-mills was 1,828,641 tons which yielded 40,860,476 pounds of refined copper or an average of 22.3 pounds per ton of rock treated. Four dividends were paid aggregating $2,304,810 and divided as follows: $1.25, March 31; $1.25, July 2; $1.50 Oct. 1, and $2.00 Dec. 22. The company is now $2.00 per share quarterly. Copper Range owns all of Baltic, Trimountain and half of Champion.

The growth of production of the three mines during the past four months is shown by the following tabulation:

	1906.	1905.	1904	1903.
Baltic	14,397,557	14,384,684	12,177,729	10,580,997
Champion	16,954,986	15,707,426	12,212,954	10,564,147
Trimountain	9,507,933	10,476,462	10,211,230	9,237,051
	40,860,476	40,568,572	34,606,913	30,382,195

The 1906 increase over that of 1905 was not particularly striking, but taking the past four years for a basis, the gain has been, as may be seen by this tabulation, 10,478,281 pounds of refined copper or 34 per cent. Deducting Champion mine's half—8,477,483 pounds— the Copper Range product for 1906 aws 32,382,993 pounds. In 1907 the company will likely show an increase of from 4,000,000 to 5,000,000 pounds, or a total product for the year of about 36,000,000 pounds of refined copper.

The annual report for 1906 shows that the stock earns $7.38 per share. Average price received was 19 cents, against 15.56 cents in 1905 and 13.24 cents in 1904. Net income of the Consolidated Company for 1906 was $3,193,109 against $2,517,686 the previous year.

After construction the earnings were equal to $7.38 per share.

The profits from the individual mines were as follows:

Baltic	$1,548,216
Champion (one half)	919,407
Trimountain	709,758

There was expended for construction at—

Baltic	$178,273
Champion (one half)	87,190
Trimountain	74,250
Copper Range R. R.	53,276
	$392,990

The mines are opened up on practical lines and for three or four years ahead and additional stamping facilities are being provided. With the extensive improvement and economies which are underway completed and in commission, the output of rock and product of copper should show a steady increase for a long time to come.

Trimountain is showing up better and copper returns from the rock treated in the stampmill reflect the improvement. The management expects a further improvement yet. The Globe property will very likely add materially to the value of Copper Range, as the south drifts going over in the direction of Globe from Champion mine continue to show up values as good as the average of the lode. Production from this quarter, however, need not be expected for some time, as much sinking and drifting

must be done to put the property in condition to send out a product. The company is reported to be sold up to next June at prices ranging from 22½ to 24½ cents per pound.

Copper Range Consolidated Company was organized primarily for the purpose of acquiring the stock of the Copper Range Company and the Baltic Mining Company. It now controls and practically owns the Baltic and Trimountain mines and one-half of the Champion mine, the Copper Range Company, Copper Range Railroad Company and the Michigan Smelting Company. All six mines forming the organization are money makers and have solid merit; are well located, practically young and in fine physical condition with plenty of room for further expansion; are well managed and certain to appreciate in value for years to come.

Among the assets of the company are:

99,659 shares of the Baltic Mining Company.
99,674 shares of the Copper Range Company.
98,649 shares of the Trimountain Mining Company.
829 shares of the Copper Range Consolidated Company held by the treasurer for exchange for the outstanding shares of the Baltic Mining Company and the Copper Range Company.
$615,000 Copper Range Railroad Company bonds at par.
1,398,600 Copper Range Railroad Company stock at par.

The directors of the Copper Range Consolidated have not formally accepted the option on the Globe property, as it does not expire until April 20, 1908, but stockholders are asked to authorize the issue of the additional shares for this purpose on the day of the annual meeting, May 1, to save the necessity of calling another meeting of stockholders at a later date, preceding the annual meeting next year.

The option on the Globe property was secured under an agreement made between the Copper Range Consolidated and John Stanton, dated April 20, 1905. The Globe property comprises 1,280 acres of mineral land, being the entire Sections 1 and 2, in Township 53, North of 35 West, lying directly south of and adjoining the Champion Copper Company, and is now in process of development. The agreement provides that in event of the Copper Range exercising its option and acquiring the property, the vendor should have the option of taking 10,000 shares of Copper Range Consolidated Company's stock in lieu of cash in full payment for the land.

BALTIC MINE.

General office, Boston, Mass; mine office, South Range, Houghton county, Mich; president, W. A. Paine; secretary-treasurer, Frederic Stanwood; general manager, F. W. Denton; mining captain, John Jolly; clerk, William C. Cole; engineer, Clarence Mason; mining captain, Martin Trethewey.

Though young, practically in its infancy, Baltic is a fine mine, a substantial producer in a prosperous condition, has solid merit with roon for further expansion and is on the way for bigger and better results. Baltic is described at some length in my previous report. Anything further just now touching its workings or the methods in use for recovering the product would be little other than a repetition of what I have already written. However, something can be always said regarding such an interesting property. About nine years ago, the place that is now Baltic location was a part of the wilderness with the primeval forest all around. Today it is a substantial mine with a location built up that any company might be proud to own affording employment for a thousand workmen; a fine business enterprise, prosperous and is the main support for the town of South Range. From the beginning the mine has been ably and conservatively managed. Progress has been substantial, continuous, of the right kind that brings results and practically every department is running successfully. Everything in and about the mine looks well and nothing seems to be neglected.

At the beginning of the year, Mr. F. W. Denton was advanced from the position of agent of the Copper Range Mines to that of general manager. The success achieved in operating the properties during Mr. Denton's administration is of the best and results obtained amply proves the advancement was merited and in order.

The Company mines the Baltic lode, which is opened up on broad practical lines and taken out on methods splendidly adapted for such a wide irregular formation that develops its best values in bunches, sometimes in the foot, sometimes in the hanging and then again somewhere else. The management aims to get out practically all the values contained in the lode in the best way for getting the best results. The work has been well done and all over, the property is in fine condition. The mine is developed through four active shafts: Nos. 2, 3, 4 and 5, numbered from south to north and averaging about 1,400 feet deep. Shafts are practically duplicates, are connected underground and air circulates freely through the openings. About 70 power drills are operated.

Mechanical equipment is new, powerful, highly efficient and up-to-date in every particular. Shaft and rock houses are of the combination build and equipped with powerful rock crushers and trip hammers operated by engines located in the same buildings. Underground openings are developed for years ahead and the product comes from all over the mine. Average length of openings in the lode is now 5,000 feet. No place shows better values than the deepest openings.

Since the beginning, the management has been bending its energies toward strengthening the position of the mine and increasing its producing capacity.

The following tabulation shows the annual products of copper made for the past four years:

1906.	1905.	1904.	1903.
14,397,557	14,397,557	12,177,729	10,580,997

The 1904 figures cover only 11 months' production, as a strike early in that year curtailed operations for at least a month.

	1906.	1905.	1904.	1903.
Net profit	$1,369,942	$1,059,165	$494,869	$397,629
Cost per ton rock	$1.52	$1.65	$2.12	$2.43
Cost per pound copper	8.37c	8.47c	7.66c	8.00c
New openings (feet)	8,083	5,813	6,814	11,349

Dividends paid in 1906 on Baltic stock were $1,400,000, leaving surplus Dec. 31, 1906, of $454,775.

The comparison shows a healthy growth and a most satisfactory condition of affairs. But there are still better things ahead for the company.

The number of tons of rock treated by the Baltic in 1906 was 649,932, which yielded 14,397,557 pounds of refined copper or 22.15 per ton treated, as compared with 604,709 stamped in 1905, yielding 14,384,684 pounds of refined copper and at the rate of 22.74 pounds per ton of rock treated. The mine is now sending out 2,300 tons of rock daily and a further increase in the rock output and product of copper may be expected about the middle of this summer. Two additional heads are being installed at the stamp mill, and will likely be in commission lot later than July month. As soon as this work is completed and the new milling facilities are in service, the rock output will be increased, perhaps, to about 3,000 tons per day. With average copper values, the annual product of refined copper will then be at the rate of approximately 18,000,000 pounds and recovered at a cost of something like 9 cents per pound exclusive of the expenses for betterment work. No. 2 shaft equipment, which is among the best in the district for economical results, was completed during the year under review and this shaft is now in regular commission and contributing its quota to the mine product. Recent developments in the lode tributary to No. 2 show considerable improvement over early disclosure, affording much satisfaction for the future in this quarter. Openings extending south in the direction of Trimountain are now showing copper values as good as the average of the mine. When first opened and for some distance down in No. 2 shaft, the lode was poor and unprofitable. This change for the better at greater depth is of much importance to the Company and may indicate that practically all the ground extending over to Trimountain boundary, where there is ample room for another shaft, may be as highly enriched with the usual grades of copper as the average of the Baltic lode Shafts are sinking to greater depth, drifts extending to greater length in the formation and the usual amount of ground is being opened up all through the workings for economical and successful mining. The lode looks first-rate—fully up to the average and the future of the Baltic looks very bright.

CHAMPION MINE.

This mine is located about seven miles south of the City of Houghton on a line of the Copper Range Railroad. Adjoins Trimountain on the north and the Globe property on the south. The company was incorporated in 1899 under the mining laws of the State of Michigan. Capitalization, $2,500,000, in 100,000 shares of a par value of $25 each.

President, William A. Paine; vice-president, F. Stanwood; secretary-treasurer, Frederic Stanwood; general manager, F. W. Denton.

General office, State Street, Boston, Mass.; mine office, Painesdale, Michigan.

One-half the capital stock issue, 50,000 shares, is owned by the St. Mary's Canal Mineral Land Company. The Copper Range Consolidated owns the other 50,000 shares.

The mine location lies in Sections 30 and 31 in Town 54, Range 34 and in Sections 25 and 36, Town 54, Range 35. The lands owned consists of 1,240 acres and carries the Baltic lode, in which the mine is opened for over 9,000 feet in length.

Champion forms one of the sound, substantial mines of the Lake Superior district; a property of great value and a fine business enterprise. From the beginning, the property has been in charge of competent people who know the business thoroughly and do it right. The property was opened up, developed, equipped, put in successful operation and brought to a legitimate dividend basis with record speed. And the work was done in the most practical business-like way. Results obtained reflect excellent management.

The following table gives the number of tons of rock treated, pounds of rock recovered per ton and products of copper made during the past four years:

	1906.	1905.	1904.	1903.
Tons rock treated	671,785	603,745	442,161	389,082
Pounds copper obtained	16,954,986	15,707,426	12,212,954	10,564,147
Pounds copper per ton rock.	25.24	26.	27.6	27.2

The 1904 figures cover only 11 months' production, as a strike early in that year curtailed operations for at least a month.

	1906.	1905.	1904.	1903.
Net profit	1,654,435	976,770	246,633	292,858
Dividends	1,200,000	1,000,000	200,000	300,000
Surplus	594,961	def23,230	46,663	def7,143
Cost per ton rock	$1.65	$1.57	$1.61	$1.60
Cost per pound copper	8.21c	8.25c	8.42c	8.88c
New openings (feet)	11,334	7,052	8,180	6,369

Including previous surplus of $140,526, the surplus Dec. 31, 1906, is $594,961.

The comparison shows a healthy growth and a most satisfactory condition of affairs. To be sure, there is noticeable a slight falling off

in the percentage of copper recovered, but with the prices that have ruled for the metal during the past year or two, rock can be stamped at aprofit that would hardly pay a few years ago. Besides the mine openings are continually getting deeper and longer, and practically certain to run into some lean ground sooner or later that will bring down the percentage of copper to a lower average. However, at the present time the lode looks first-rate and is in the pink of physical condition.

In 1906 the company paid $1,200,000 in dividends or $125 per share as against $10 per share paid in 1905, $2 in 1904 and $3 in 1902.

All stoping work is done on company account. Sinking and drifting on contract. All told, there are 1,000 names on the payroll and on an average, 70 machine drills are operated. The mine is opened through four fine shafts located about 1,000 feet apart on the strike line of the lode. Shafts are uniform in dimensions, three-compartment with average depth of 1,300 feet. Two compartments of each are used for hoisting rock, the third for ladder and pipes. All four shafts are connected underground on different levels that keep the mine well ventilated, cool, dry and comfortable for working in. Underground openings are over 5,000 feet in length and hold an enormous amount of ground reserves containing the average values of the Baltic lode. The lode looks well all over and nowhere better than in the latest points penetrated. The product comes from various stopes and openings on different levels, but all tributary to the four shafts, each sending out its allotted quota of rock. Shafts are going down and the usual number of drift stopes are going forward into new ground, developing fresh reserves in accordance with the policy of the management. The "back-caving-filling-in" method is used for taking out the lode and it works admirably. It is comparatively safe for men and requires but little timber. Skips counter-balance in the shafts carrying from two to four tons of rock to a trip and dumps automatically on grizzles. Practically all the rock selecting is done underground.

Though a young mine, as age goes, Champion ranks second to Quincy as an individual producer and second to Calumet & Hecla as a money maker. It is the heaviest producer of copper south of the Portage Lake, though followed closely by the Baltic. The splendid success achieved, however, is due to the richness of the lode mined as well as to the competency of the management. Champion mine workings encompass the richest portion thus far uncovered and developed. The lode is wide, running from 15 to 40 feet wide and averaging about 24. It dips at an angle of 70 degrees and is highly enriched from foot-wall to hanging with various grades of copper. While a stamp mill proposition, it carries an unusual percentage of rough copper, which comes out in chunks from a pound or two to as much as a ton or more in weight and classed as mass and barrel work. Masses weighing ten tons have been taken out, and this is the cheapest part of the product made as the chunks go direct to the smelting works practically as they come out of the mine. Improve-

ments and economies underway when completed and in service will result in increasing the producing capacity of the mine and in reducing somewhat, operating costs. The management is progressive and aims to get out the best there is in the property and turn it into profitable account. While progress has been continuous and results substantial, the property is little, if any, more than in its infancy and the management plans to develop and operate it on a far larger scope than the present scale of operations.

The plant is in thorough repair and works well. Location and works are lighted by electricity. Underground and on surface, Champion is in fine physical condition and economically operated.

TRIMOUNTAIN.

Trimountain is situated about midway between Baltic and Champion mines and owns 1,120 acres of land located at Section 19, 20 and 30 in Town 54, Range 39, purchased at a cost of $800,000.

Capitalization, $2,500,000, divided into 100,000 shares. Par value, $25 each. Paid in, $20 per share.

Main office, 27 State St., Boston, Mass.; mine office, Trimountain, Michigan.

President, W. A. Paine; secretary-treasurer, Frederic Stanwood; general manager, F. W. Denton; mining captain, Richard Bowden; clerk, B. D. Noetzel; engineer, H. T. Mercer; underground superintendent, John Jolly.

The Trimountain is a subsidiary property of the Copper Range Consolidated. Control passed to this Company in 1903. Of 100,000 shares issued, Copper Range Consolidated control 98,649.

The property is skillfully managed and every department is running successfully and doing first class duty. In 1906 Trimountain people had a prosperous year due largely to the high price of copper. During the year there was stamped 506,924 tons of rock which yielded 9,507,933 pounds of refined copper or at the rate of 18.75 pounds per ton treated. In 1905 the quantity stamped was 570,843 tons and recovered 10,476,462 pounds of refined copper or at the rate of 18.36 pounds per ton of rock treated. The yield for 1906 shows a slight gain over that of 1905 and 1907 will likely show a gain over 1906.

The following table shows the number of tons of rock treated, pounds of copper recovered per ton and the products of copper made during the past years:

	1906.	1905.	1904.
Tons of rock treated	506,924	570,843	534,640
Products of refined copper	9,507,933	10,476,462	10,211,230
Pounds copper recovered, per ton	18.76	18.36	19.1
Net profits	$635,508	$475,702	$322,220
Cost per ton rock	$1.86	$1.59	$1.89

	1906.	1905.	1904.
Cost per pound copper	11.4c	10.5	9.88c
New openings (feet)	7,300	5,257	5,477

Since passing to the control of the Copper Range, the mine has failed to develop such satisfactory values as the former management succeeded in obtaining. This, however, is due to a lack of equal copper contents contained in the lode at increased depth. When first opened, the mine developed ground carrying mineral values of exceptional richness in mass and barrel copper, which held down to the 7th level, and the property was opened up, equipped and put on a dividend basis with record speed. $300,000 were paid in dividends and the price of the shares advanced to high figures, though the company had a big floating debt at the time. Between the 7th and 12th levels, there happened to come in a bar of leaner ground carrying values to the extent of about 18 pounds to the ton of rock after careful selecting. In the vicinity of the 12th level, however, the formation begins to show up better again in the different grades of copper. The improvement is quite likely to continue and be reflected in the product at the end of the year in hand. And changing in the method of mining for taking out the product of rock may also have had something to do with the falling off in the percentage of copper recovered. The "back-filling-in or caving system" is now used for recovering the product and it answers admirably. It is practically safe for men and convenient for mining. But little timber is used in the work. Waste rock built into dry walls answers for stulls of timber and tagging. Expense of tramming and hoisting poor rock is nominal. The mine is operated through four fine shafts, duplicates and three-compartment. Shafts are located about 1,000 feet apart and average about 1,400 feet in depth. Levels are 100 feet apart connected all through the mine. Ventilation and sanitary conditions are good. Levels are extended on the drift-stope method continued to the end of the boundary of the mine or to the end of the copper ground desired to be taken out. Drift-stopes run from 8 to 10 feet high and carry the whole width of the lode. Most of the rock is assorted underground instead of on surface, which saves the cost of tramming and hoisting the waste. All stoping is done on company account, drifting and sinking on contract. The policy of the management is to open up large blocks of copper ground ahead that may be drawn upon when needed and in which the miners may be distributed to advantage and get the best results. Average length of openings is 3,500 feet. From end to end, however, the openings reach as much as 4,500 feet in length.

All told, 900 men are employed and about 65 power drills are operated. The product is taken out from the second to the fourteenth levels and from all over the mine. Regular sinking and drifting are going forward and the usual amount of new ground is being developed and put in condition for economical mining.

The mechanical equipment, which is of the best and in first class shape and running satisfactorily. From end to end, the physical condition of the property is about all that could be desired and the outlook for the mine is decidedly promising.

COPPER RANGE RAILROAD COMPANY.

This company was organized in 1899 under the laws of the State of Michigan. Authorized capital, $5,000,000, par value, $100.00. Issued, $3,886,900.

President, William A. Paine; secretary-treasurer, Frederic Stanwood; general manager, R. T. McKeever; general superintendent, C. S. Fales; main office, Boston, Mass.; local office, Houghton, Michigan.

The Copper Range Railroad runs from Calumet to Mass City, a distance of 59 miles. It connects with the Chicago, Milwaukee & St. Paul Railroad at Mass for all points southeast and west, runs through the center of the mining district of the South Range and crosses Portage Lake at Houghton and Hancock; extends to Calumet and Laurium and will connect with the Keweenaw Central Railroad, which is building along the North Range to Lac La Belle and Copper Harbor. The Copper Range equipment is of modern type, its engines are of the finest and all passenger trains are made up of Pullman coaches. The road runs through a prosperous country and its business, both passenger and freight, is steadily increasing.

COPPER RANGE COMPANY.

The Copper Range Company was organized in 1899 to construct a railroad in the copper district of Michigan and managed to secure the rights and franchise of the Northern Michigan R. R. Company. It was afterwards reorganized under the title of the Copper Range Railroad Company. The company owned about 10,000 acres of mineral land south of the Baltic mine and furnished one-half of the land forming the Champion mine tract and on which the mine is located. The St. Mary's Mineral Land Company provided the other half.

The Copper Range Company organized and incorporated the Champion Mining Company, in 1899, and though the company's mine is practically new, it now forms one of the most valuable copper properties in the Lake district.

Included in the Company's assets are 9,360 acres of land, 50,000 shares of the Champion Copper Company's stock and 26,051 shares of the Copper Range Railroad Company.

President, Wm. A. Paine; secretary-treasurer, Frederic Stanwood.

ATLANTIC MINING COMPANY.

President, Joseph E. Gay; treasurer, John R. Stanton; agent F. McM. Stanton; superintendent, Theo. Dengler; clerk, A. D. Edwards; mining captain, John Stratton.

Capitalization, $2,500,000 in 100,000 shares, par value $25 each.

The workings of the Atlantic mine on the Ashbed Amygdaloid are still closed and just when an effort will be made to re-open there, has not yet been decided by the management. Early in May, 1906, the hanging wall side of the underground workings crushed in and abruptly and completely put the company out of business as a producer of copper. No work has been done there since. This was a pathetic condition of affairs and deplored by everybody. Atlantic is among the best known mines in the upper peninsula and has been frequently referred to as a first-rate example of the well managed mines of the Lake Superior district. The company's annual report ending Dec. 31, 1906, covers a year in which the product of copper was made in a little over four months. Since the old mine crushed in, all operations have been confined to exploratory work and the necessary work in conjunction therewith. The company is now sinking an exploratory shaft on its Section 16, which is down over 260 feet deep. It is planned to sink it one thousand feet deep before attempting to drive any extensive lateral openings. In view of recent developments elsewhere with the diamond drill, the policy of sinking to such depth before running out drifts is generally commended. Section 16 lies directly between the Baltic and Superior mines, and carries the underlay of the Baltic lode for 1¼ miles in length. This lode is quite fully described in my previous report. Baltic mine is one of the best in the district and making a fine record. Superior is a developing proposition and looking well. It promises to develop into a substantial profitable mine. Both are mining the Baltic lode. There seems to be a good chance for the Atlantic Company to develop here in Section 16 a much better mine than the old one ever was.

The directors present the following report of the operations during the year 1906.

The production of mineral was 1,944,460 pounds, which yielded 74.01 per cent., or 1,439,082 pounds of refined copper, for which was realized about 18.43 cents per pound.

The following is a summary of the year's business:

RECEIPTS.

From 1,439,082 pounds of copper	$265,161.34
From interest	2,982.94
	$268,144.18

EXPENDITURES.

Working expenses at mine	$219,811.47	
Smelting freight and other expenses	2,389.93	242,201.40
Showing a profit of		$25,942.88
There has been expended for construction and for exploring		65,803.39
Making a deficit for the year of		$39,860.51
Surplus, Dec. 31, 1905, was		$365,220.02

Making the net surplus December 31, 1906, $325,359.51 as showed in the following statement of assets and liabilities:

Assets and liabilities December 31, 1906:

ASSETS.

Cash in bank	$138,408.96
Stock of Michigan Smelting Company	40,000.00
Cash and supplies at mine	47,936.11
Coal on hand at mine	47,272.10
Merchandise in store at mine	58,459.36
	$332,076.53

LIABILITIES.

Indebtedness at mine	$6,844.76	
Accounts payable	382.26	$6,717.02
Balance of assets		$325,359.51

ISLE ROYALE CONSOLIDATED MINING COMPANY.

President, A. S. Bigelow; secretary-treasurer, W. J. Ladd; general manager, Norman W. Haire; superintendent, W. J. Uren; assistant superintendent, James E. Richards; clerk, H. D. Haddock; mining captain Edward Colenso; stamp mill superintendent, J. G. Glanville; main office Boston, Mass; mine office, Houghton, Mich.

A description of this property appears in my previous report and the time is too short since its publication for any decided change to occur in its physical aspect. Anything further under this heading just now would not be much other than a repetition of what I have written. However, a few passing remarks may be in order.

On account of the importance of the policy outlined by the management and the mining profit made as a result of the year's operations, which was $229,604, the year 1906 may justly be considered the best year in the history of this company.

The management is among the best going, knows the business thoroughly, is progressive and believes in doing things right, for stretching out for far better things than have yet been achieved at the Isle Royale

mine. The year was one of work, progress and distinctive results. Shafts were sunk deeper, levels extended further and a large amount of new ground, carrying values fully as high as the average of the mine, was opened up. A considerable portion of it will make good stoping ground. The mine is developed on practical lines, and the product taken out the best way for bringing the most satisfactory results.

Isle Royale has an immense acreage consisting of something over 3,000 acres of mineral land carrying the Isle Royale, Grand Portage and Baltic lodes, on their strike line for two miles or more in length. Its lode area is vast and a number of shafts may be sunk down to great depth before passing the company's boundary lines. It is capable of tremendous expansion and may be developed to an extent sufficient to furnish an enormous rock tonnage and to produce a big product of copper. The management has planned to develop this property on a scope somewhat commensurate with its possibilities and work to that end has been started some of which is well underway. The lode mined is low grade yielding about 15 pounds of copper to the ton of rock, but it is an exceedingly strong formation and possesses great stabilities of values. This is essentially an age of big things and what is wanted today is a big product manipulated at a maximum cost for herein lies the secret of successful modern mining. The management has unbounded faith in the property and fully believes it can be developed into a mine that any company may be proud of.

The annual report of the company for the year ending December 31, 1906, shows no important changes in comparison with the results of the previous year. As a result of higher wages, higher prices for supplies and material, besides doing a great deal of betterment work, operating costs were somewhat higher. The product of fine copper was 2,937,098 pounds as against 2,973,761 pounds in 1905. Treasury surplus balance was $772,592, being an increase of $156,592 over that of the previous year. Number of men employed was 336 and number of drills operated 26.

The company's annual report is very interesting and worth reading. Here it is:

The income account in detail shows as follows:

2,937,098 pounds of copper at 18.81 cents		$552,370
Other income		35,969
Total		588,340
Running expenses at mine	$294,556	
Smelting, transportation, etc.	64,178	
Profit		229,604
Exploration work		72,637
Net balance		156,967
Balance of assets December 31, 1905		615,625
Balance of assets December 31, 1906		772,592

We make the following comparison:

	1906.	1905.	1904.	1903.
Tons rock hoisted	237,595	226,788	178,046	.....
Tons rock stamped	192,210	195,150	154,830	199,493
Pounds mineral	4,076,509	4,032,402	3,343,010	4,408,615
Pounds copper per ton stamped	15.3	15.2	15.8	15.7
Pounds copper	2,937,098	2,973,761	2,942,905	3,134,601
Cost per pound exclusive of Construction	10.03c	9.19c	9.62c	9.81c
Cost, smelting, etc.	2.19c	2.05c	2.20c	1.81c
Total cost per pound	12.22c	11.58c	12.02c	11.85c
Cost mining and stamping	$1.53	$1.40	$1.52	$1.54
Cost stamping per ton	27.25c	24.77c	30.51c	28.84c

The cost in 1906 per pound for exploration, railroad extension, etc., was 2.47c, making a total cost of copper 14.69c against 12.76c in 1905.

Opening work for the year was:

Sinking shafts	865
Drifting on lode	6,937
Crosscutting	449.5
Total	8,251.5

Vice-president and General-Manager Haire says: The amount of new ground opened on the Isle Royale lode far exceeds that of any year since 1901. The energy of our entire force has been directed towards increasing our stoping territory. For this season we are rushing the work at our new shafts with all possible despatch. The "bunchy" character of the Isle Royale lode compels us to keep our openings well in advance of stoping requirements. With such a large amount of new work required, including drifting, exploration, etc., it has been a difficult task to keep our costs within reasonable bounds; besides, the costs of labor and supplies have both materially increased since 1905. To offset the above conditions we have kept all our general expenses down to the lowest possible limit.

On July 1st, 1906, we established a purchasing department for all our mines, mills, smelter, and other auxiliary companies at the general office in Houghton. Favorable results have fully justified this arrangement.

Total openings for the year aggregated 8,251 feet, total drifting on the Isle Royale lode amounting to 6,937 feet.

Work at No. 2 shaft has progressed steadily without any material check for the entire year. We have paid especial attention to increasing openings of new ground. The new openings to the south of the shaft have generally been fair, while north they are lean, with the exception

of the 21st level. Here some fair stoping ground has been encountered both north and south. On Dec. 31 the shaft had reached a depth of 2,237 feet and is now below the 22nd level.

The shaft which heretofore has been known as "Section 11 exploratory shaft" will hereafter be known as No. 6. It was sunk only 103 feet for the year and is just below the third level. As soon as our new No. 5 shaft is in commission we intend to close down No. 6 temporarily for the purpose of enlarging it to a double compartment with ladderway. We must soon arrange for the installation of a permanent hoist and a large compressor at this point.

New openings for the year aggregated 2,364 feet north and south of the shaft. A goodly proportion of these openings show up fair for copper rock. Rock tonnage cannot be appreciably increased until the shaft is enlarged.

No. 5 shaft is located on the Isle Royale lode 2,100 feet north of No. 6. We first used the diamond drill to determine the position of the ledge. The core taken from here was a fine looking amygdaloid quite heavily charged with copper. A heavy burden composed of sand and boulders obliged us to sink a large vertical drop shaft 20x28 feet down to the ledge. This was 45 feet deep on Dec. 31. Since that date we have reached the ledge at a depth of 86 feet. We have already blasted out some good looking copper rock. The shaft will be double compartment with ladderway. Concrete will be substituted for timber wherever possible, thereby lessening the danger from fire. Barring extraordinary contingencies, we should make considerable progress in sinking No. 5 shaft before the end of 1907.

About 2,000 feet north of No. 5 we have located with a diamond drill a place for another shaft, to be known as No. 4. There is very little overburden at this point. The drill core taken from here closely resembled the one taken from No. 5. As soon as we have No. 5 fairly underway we intend to begin work at No. 4.

On December 31 the shaft known as "Section 12" had reached a depth of 475 feet. For the entire distance the formation has been broken and disorganized. At a depth of 350 feet from the surface we drove a cross-cut northwest from the shaft for a distance of 449½ feet, intercepted four beds of amygdaloid showing no copper. All were in a state of disorganization. For some time past we have been sinking, but the lode has not yet become settled; we should have a change in conditions at greater depth.

In addition to the diamond drill work on the Isle Royale lode, for the purpose of locating our proposed new shafts, we have done considerable drilling between the old Mabb's shaft on Section 12, but with no very satisfactory results. It is our intention to continue this work during the entire year of 1907. It will take many years to thoroughly explore all of Isle Royale territory.

ST. MARY'S MINERAL LAND COMPANY.

Capital stock, 160,000 shares.

President, Nathaniel Thayer; vice presidents, Charles J. Paine and J. Henry Brooks; secretary-treasurer, Arthur G. Stanwood; agent, R. R. Goodell; general manager of mines, L. L. Hubbard.

The annual report of this company for 1906 forms an intresting pamphlet and could not be otherwise than satisfactory to the shareholders. Its balance sheet shows a remarkable growth with enormous possibilities for further expansion. The assets consist of cash, valuable lands and shares of stock in different mining companies. No one can form any definite conception of the potential value of the company's treasury, as the lands and shares of stock will certainly appreciate in value with the coming years. There are no liabilities. Just think of that. This is a condition as rare as it is unique in this age of "note placing" and industrial expansion. Instead of selling its lands for cash the company now receives payment in stock of purchasing company. This policy proves a wise, judicious one and the success achieved reflects excellent management. As a result, the company has built up a treasury of great worth and perhaps for greater potential value.

The possibilities of the St. Mary's company are enormous and can hardly be measured by ordinary mathematics. So far as anyone knows thet vast acreage of the company may hold many Baltics, perhaps Calumet & Heclas, for the lands are located in one of the richest copper bearing districts on the globe, and that has scarcely been more than "pin pricked."

Following is a modified copy of the company's report: Director's report for the year ending December 31, 1906:

Sales during the year were as follows:

400 acres of land, in fee simple, for	$262,500.00
20 acres of land, the mineral rights to which were reserved	500.00
Mineral rights in 595 65-100 acres, the surface having been sold previously	300,000.00
Wood and timber	9,300.00
Total sales	$572,300.00

The real property of the company, December 31, 1906, consisted of 95,378.82 acres, besides which the company owns the mineral rights in 14,043.61 additional acres. A full statement of the real and personal property of the company will follow.

The company received $600,000 in dividends from its half of the Champion Mining company. A considerable part of the property sold during the year has been paid for in the capital stock of companies organized to develop it. The mineral rights in 595.65 acres, lying to the south and west of, and adjoining, the Quincy mine, one of the oldest dividend paying copper mines in the world, were sold to a newly organized company,

called the Hancock Consolidated Mining company, for $100,000 cash and 20,000 shares of Hancock stock, with $10 per share endorsed as paid That company also acquired other adjoining lands including the Old Hancock mine, which was formerly a producer, but which has been closed since 1885.

Another important sale was that of 400 acres of the Caldwell Copper company, organized under our auspices to acquire the above mentioned 400 acres and 160 acres belonging to other interests, all carrying the Kearsarge lode and adjoining the Tecumseh mine. The Caldwell company was capitalized with 100,000 shares, of which 49,000 shares ($7.50 per share paid) were issued pro-rata to the owners of the 560 acres of land, leaving 51,000 shares in the treasury. An arrangement was made with the Calumet & Hecla Mining company by which that company agreed to buy 7,000 shares of the treasury stock at $7.50 per share, to take the management of the property and to prosecute development work for two years with the $52,500 resulting from the sale of treasury stock. In consideration of this agreement the Calumet & Hecla company was given an option for two years at $7.50 per share on the 44,000 shares remaining in the treasury. If this option were exercised it would give the Calumet company the ownership of 51 per cent of the stock and control of the company. Work was begun at once on the Caldwell property by diamond drilling, followed by the starting of two prominent shafts. Developments on the Kearsarge lode at the Tecumseh mine were so promising that the Calumet company was led to propose a combination of Caldwell property with Tecumseh and other adjoining lands. The combination has been effected and the La Salle Copper company, control of which rests with the Calumet & Hecla Mining company, has been organized, with an authorized capital of 400,000 shares. Approximately 300,000 shares have been issued to acquire the Tecumseh mine, the Caldwell property and adjoining lands, and to provide a treasury fund of $1,000,000, and about 100,000 shares remain in the treasury. Our stock in the Caldwell company has been converted into 20,165 shares of La Salle stock.

We have received during the year from the Champion Copper Company dividends amounting to $600,000. This sum does not represent one-half of the profits of the year. The difference is accounted for by copper made and sold but not paid for.

ASSETS.

December 31,1906.

Land unsold, 95,378.82 acres.

Mineral rights to 14,043.61 acres.

Challenge Location:

50,000 shares of stock of the Champion Copper company.

53,691 shares of stock of the King Philip Copper company.

20,000 shares of stock of the Hancock Consolidated Mining Co.

20,165 shares of stock of the La Salle Copper company.

20,000 shares of stock of the Pacific Copper company.
208 shares of stock of the Copper Range Consolidated company.
842 shares of stock of the Winona Copper company.
80 shares of stock of the Old Colony Copper company.
25,000 shares of stock of the Mayflower Mining company
640 shares of stock of the St. Mary's Mineral Land company.
10 shares of stock of the Amphidrome Co., Houghton, Mich.

Notes receivable.....$ 66,000.00
Cash on deposit..... 675,747.75

LIABILITIES—None.

Dr. L. L. Hubbard reports the exploratory work done during 1906 at the Challenge location was as follows:

The shaft was sunk to the third level.....274.5 feet

Second Level—
The east crosscut was extended .....345 feet
Drifts on No. 5 lode ..... 41 feet
The west cross-cut was extended .....170.5 feet
Drifts on No. 1 lode .....201 feet
Third Level—
The east cross-cut was extended ..... 82 feet
The west crosscut was extended .....253 feet
Drifts on No. 1 lode ..... 66 feet

Total drifts and crosscuts.....1,157.5 feet

The above work cost as follows, including administration and excluding construction:

Shaft sinking ..... 274.5 feet at $55.22
Drifting .....1,157.5 feet at 18.09

Estimating the relative expense, per foot, of shaft sinking and drifting, as three to one, construction per foot of drifting (and sinking) cost $7.48.

We now have a well equipped plant, capable of deepening and extending our openings, and the cost per foot during the coming summer should be less for actual operation, and little or nothing for construction.

The underground openings have disclosed five different amygdaloid lodes; No. 1, the most westerly, is supposed to be the Baltic horizon. It is 39 feet wide and upwards, and in some places has shown small pockets of copper. In the third level it appears to be much disturbed and broken, and its intersection with the cross-cut is about 50 feet nearer No. 2 than in the level above.

Lode No. 2 is about 20 feet wide, and consists of brecciated amygdaloid rock in a fine-grained, red to brown matrix, resembling sandstone. It has disclosed nothing of value. Lode No. 3 is about 12 feet wide, amygdaloid and carries no values. Lode No. 4 is about 25 feet wide

and amygdaloid. Lode No. 5 is about 39 feet wide, very epidotic with quartz, and where first cut on the hanging showed good copper values for about 4 feet in width. Drifting to the south of this lode shows rather less copper than opposite the cross-cut.

On the whole, the result of last year's work has not been positively encouraging, but in view of the experience of several mines in this district, where values have not been disclosed in commercial quantity, until great depths have been attained, I strongly recommend that the shaft be sunk deeper into more settled ground, and that the crosscut be extended both east and west.

Average number of employed during 1906 was 40.

The Challenge is among the first companies to enter upon an extended investigation of the mining field of which so little is known beyond its Baltic lode possession. Newly discovered outcroppings and masses of float copper have been contributing factors to the data gained in this direction the past year. No one believes for a moment that the Copper Range Consolidated values are confined to those of the Baltic lode, and in due season the lands of this company will receive a thorough investigation. The Challenge has a length on the Baltic lode of about six miles, while in its dip of 71 degrees is to be found the fullest assurance of maximum operating depths. The tract is the first one upon which its owners spent a dollar for exploratory purposes in this district, the entire values of which they at one time practically controlled.

KING PHILIP COPPER COMPANY.

Capital stock, One Hundred Thousand (100,000) Shares. Par, $25. Seventy Thousand (70,000) Shares Issued. $6 per share paid in.

Officers: President, Arthur G. Stanwood; vice-president, George P. Gardner; secretary-treasurer, Edward B. O'Connor. Office, 713 Sears Building, Moston, Mass.

President Stanwood reports the Company was organized in November, 1905, with an authoriezd issue of 100,000 shares of capital stock, of which 50,000 shares were issued to pay for the mine location, 20,000 shares were sold at $6 per share to provide a development fund, and 30,000 shares were left in the treasury.

The mine location consists of 1,040 acres of land contiguous to the property of the Winona Copper company and carrying the Winona lode, which had been opened on the Winona property in levels extending nearly up to our boundary line.

Not much work was possible until the ground was free from snow in the spring of 1906. Then an inclined shaft was started in the trap rock underlying the Winona lode. It is expected that this shaft will reach a depth of 400 feet about April 1, 1907, when a cross-cut will be made to the Winona lode.

By an exchange of about five acres of mineral land with the Winona Copper Company, the boundary line between the two companies has been made to run at right angles with the outcrop of the lode.

For a statement of what has been done at the mine during the year, your attention is called to the General Manager's report on the following pages.

Dr. L. L. Hubbard reports in part:

In November, 1905, after making soundings in the overburden with a small pipe, by which the ledge was supposed to be located 64 feet below the surface, excavation was commenced and timbers afterward laid at 24 feet from the surface, for a three-compartment inclined shaft about 50 feet in the footwall, back of the supposed position of the Winona lode.

With the aid of a diamond drill equipment, we then sank two large pipes at a point of 75 feet further southwest on the strike of the lode, and found ledge there at 50 feet from the surface. A third pipe sunk opposite the shaft showed the true depth of the ledge under the shaft to be 75 feet. By August 1st, the shaft was 82 feet deep, 28 feet in rock. Inasmuch as the ledge was known to fall off steeply on the hanging side, progress had to be slow for fear of breaking through into quicksand. The inflow of water made work difficult, and the scarcity of labor was a further impediment to progress. The shaft on December 31st was 217 feet deep.

Crosscutting to the lode will begin at a point that corresponds nearly with the 5th level of the Winona mine, this being supposed to be at a safe depth below the point where the lode meets the rock surface. Average number of men employed, 47.

A Nordberg hoist, good for 1,500 feet, has been purchased and installed back of the shaft. The compressor and boiler will soon be removed to the same location and a frame building erected to cover this plant.

A temporary shaft house, 20 feet by 26 feet, and 20 feet by 20 feet, has been in use for several months, but it is not yet fully completed. A poor-rock trestle is nearing completion. A pumping station at the Sleeping River, 22 feet by 30 feet, has been built, and a pipe runs across this location to the Winona tank, furnishing water for the steam plant and to the houses. With the early installation of a skip in the shaft, we expect to extend the latter rapidly. If the lode be found to contain values equal to the average of those of the Winona openings, preparations should be made to sink a second shaft during the summer and to make ready for operations on a larger scale.

SUPERIOR COPPER COMPANY.

The Superior Copper company was organized in 1904, under the laws of the State of Michigan, with $2,500,000 in 100,000 shares, par value $25 each. The company has 400 acres of land in Section 15, Township 54, North of Range 34 West, in Houghton County, Michigan. It is situ-

ated just east of Section 16, belonging to the Atlantic mine, which is next, north of the Baltic Copper Mining company, belonging to the Copper Range Consolidated Company group of mines. It has about one mile of the outcrop of the "Baltic" lode and has about 400 acres of surface with underlay of the lode. This vein was opened by test pits and trenches in different places, for a length of over 3,000 feet and showed copper and copper indications at nearly every point opened and in these trenches the vein was shown to be about forty to forty-five feet in width. At the point where the No. 1 shaft was started the vein was shown to be about forty feet in width, with copper well disseminated throughout the width of the vein.

In December, 1906, Calumet & Hecla Mining Company exercised an option held on several thousand shares of Superior Copper company's stock, which gave the Bonanza Company 51 per cent of its capitalization.

Before exercising the option, Calumet & Hecla management spent over $40,000 in exploring the property. The mine is a development proposition with a fine future outlook. I have visited the mine on different occasions and have been underground there and looked over the lode opened up and exposed. The lode is wide and somewhat bunchy, but upon the whole, it looked first-rate to me. A good deal of the vein rock is remarkably deceptive in appearance. Every piece, or practically so, must be broken freshly in order to know whether it contains copper or not. Often rocks, and big ones, too, that look gray and barren from the outside, when broken show up splendid copper values. When underground there I saw heavy copper jutting out in many places and the formation contained practically all the recognized features that denote permanence and stability of values. Permanence and stability of values indicate a permanent mine. Development work is conducted through two shafts sunk in the Baltic lode and is under the supervision of Mr. James McNaughton, directing manager of the Calumet & Hecla Mining Company. No. 1 shaft is about 750 feet deep. No. 2 was started last June and is situated 2,400 feet south of No. 1. At the time of my visit, this shaft was down in the neighborhood of 200 feet below the surface. The work of opening up and developing the mine is conducted on scientific principles and in the most practical way for getting economical results. Good headway is made right along and of the kind that counts and result in success. Shafts are going down, lateral openings extending and substantial ground reserves are formed in accordance with modern methods of mining. Much of the lode opened up will make good stoping ground and turn out well. In my opinion, Superior has a good outlook and should make a profitable enterprise, and in time return good interest on the amount of money invested in the property. James Biscombe is local superintendent.

WINONA COPPER COMPANY.

Capital stock, One Hundred Thousand Shares, Par $25, $14 Per Share Paid In.

Officers: President, Arthur G. Stanwood; vice president, Nathaniel H. Stone; Secretary-treasurer, Edward B. O'Connor; general manager, Dr. L. L. Hubbard; superintendent, R. R. Seeber. Transfer Agent, American Trust Company, 53 State St., Boston, Mass. Office, 713 Sears Building, Boston, Mass.

The annual meeting of the stockholders is held on the——— Tuesday in March in every year.

Winona's report for the year 1906 reflects good management and shows the company to be in a prosperous condition. The property is in capable hands and well managed. The mine is opened up on practical mining principles and although it must be classed as low grade, it ought to return, in the long run, satisfactory dividends on a higher valuation than the shares sold for, even in the late copper boom. President Stanwood, in his annual statement, makes it very clear that the present management has faith in the company's property and expects to develop it into a substantial copper producer and a successful business enterprise. For some time past, the management has been devoting much time and effort towards strengthening the position of the mine for the purpose of increasing its capacity. Substantial progress has been made and upon the whole, the property never appeared to better advantage than at the present nor did its physical condition indicate a brighter future. Considerable new ground has been opened up on up-to-date methods and put in a condition for practical and economical extraction. Shafts have been sunk deeper and new levels extended into virgin ground that show up copper values fully as good as the average of the mine. No part of the mine shows a stronger lode or greater encouragement for the future of the property than the newest openings. Considerable ground has been developed that will make good stopes and yield substantial copper values. Still the lode is not rich. It is medium grade as results obtained clearly indicates. But like most other copper bearing amygdaloids of the Lake Superior region, it possesses great stability of values and general characteristics. During the year under review, many improvements have been made both underground and on surface and as a result, the property is now in better physical form than at any former period in its history. The mine is developed and operated through two active shafts—Nos. 3 and 4. No. 3 is 6x18 feet inside of timbers, three-compartment and 881 feet deep. Development work is underway in this shaft. No. 4 is 7x18½ feet inside timbers and was 226 feet deep on the 31st of December, 1906. Skips are operated in balance and work successfully. The average number of men employed last year was 184 and average number of power drills operated, 12. During the year 463½ feet of shafts were sunk, 506½ feet drifted in the lode and

196 feet of crosscuts driven. Opening work aggregated over a mile in length. Seven levels are being extended and the filling system is used for recovering the product. Winona is described in my previous report.

The company's report for 1906 somewhat modified is attached. President Stanwood states: "It was announced in the last annual report that the efforts of the management would be applied vigorously to the development of the mine so as to begin regular production as soon as possible. This has been done, but more time was required than we expected, so that it was not until the middle of October that we were in a position to begin shipments of rock.

It was necessary to obtain permanent equipment for No. 3 shaft, to start a new shaft called No. 4, to build a spur railroad track to connect with the Copper Range railroad, to purchase a new compressor with enlarged drill capacity, and to provide other surface equipment; and, besides, to spend upwards of $100,000 underground in extending the openings and preparing the stopes for production. A new modern steel shaft house has been erected at No. 3 and also a rock house, at least equal to any in the Lake Superior region so far as convenience and economy of operation are concerned. The new 40-drill compressor is installed and will go into commission in March. The compressor now in use has a capacity of only 12 drills.

All of this work, which is now completed, has been provided for by an assessment of $1 per share called for payment February 26, 1906, and one of $2 per share called for payment July 26, 1906. The expenditure of the money so provided has been amply justified by the developments of the year.

Our plans for 1907 calls for the erection, at No. 4 shaft, of a steel shaft house similar to that at No. 3, for the construction of twenty or thirty new dwelling houses for miners and for sundry new equipment—all at an approximate cost of $100,000, which will be provided from our present resources and from the profits of the mine.

No. 4 shaft was started May 7, 1906, on land formerly belonging to the King Philip Copper company, whose territory adjoins on the south. The old boundary line between the two properties ran diagonally across the Winona lode. By an arrangement providing for an exchange of about five acres of mineral land, the boundary line has been made to run at right angles with the outcrop of the lode, so that each company can mine out more economically its ground lying between No. 4 shaft at Winona and No. 1 shaft at King Philip. Our No. 4 shaft commands all the territory to the south of it, so that no more shafts will be required.

Additional surface room has been obtained at No. 4 shaft by the purchase of twenty acres of surface in the southeast quarter of Section 30, Township 52, Range 36, at a cost of $500.

At present we are sending daily 360 tons of rock to the stamp mill and we expect to increase our shipments from time to time so that with

the beginning of 1908 they should reach 800 tons daily. The mine has improved greatly in appearance during the year, and there are indications that there will be further improvement as the shafts attain greater depth.

A statement of the annual cost of production from the beginning in October to the close of the year would be misleading, as some time was required to get things running smoothly. In December, which may be taken as a representative month on the present basis of production, the cost was 17.15 cents per pound, including all expenses except construction. This cost will diminish materially as the tonnage of rock is increased.

Assets and liabilities, December 31, 1906:

ASSETS.

Cash in bank	$38,583.41	
Accounts receivable at Boston	28,844.63	
Supplies and cash at mine	62,415.67	
		$129,843.71

LIABILITIES.

Accounts payable at Boston	$ 4,947.49	
Accounts payable at the mine	45,687.17	$ 50,634.66
Excess of Assets, December 31, 1906	$79,209.05	

SUMMARY OF RESULTS.

Rock Stamped	19,399 tons
Product of mineral	457,775 pounds
Product of refined copper	278,182 pounds
Yield of mineral per ton of rock treated	23.59 pounds
Yield of copper per ton of rock treated	14.34 pounds

Dr. Hubbard reports:

The average number of air drills available was 12, of which an average of 7 men were employed in cutting-out and stoping, the other five in sinking, drifting, or for the most part, in development work. Beside the development work continued in No. 3 shaft, we began work in May on Shaft No. 4, 1,650 feet southwest of No. 3, and 410 feet from the King Philip boundary line. The shaft is sunk about 60 feet back of the lode in the footwall trap. It is connected by a cross-cut with the third level which extends a few feet south beyond the cross-cut. The shaft on January 1 was 41 feet below this level. Sinking continues in each shaft. No. 4 should reach the sixth level during 1907, and, if provided with a shaft house by early autumn, will add materially to our output.

Including about 700 feet of ground north of No. 3 shaft, the productive ground tributary to the two shafts is about 2,800 feet in length. This ground is variable in character, but with two shafts equipped and in commission can probably be mined throughout with profit. The rock contains rather more Lake copper than the average of mines in this district,

but we believe we see indications that as depth increases, the particles of copper are rather more compact. If this observation be correct, our tailing losses at the mill should decrease, and the yield per ton should correspondingly increase.

Shipments of rock to the Adventure mill began on the completion of our Steel shaft and rock-house in the middle of October, and have continued regularly at the rate of about 360 tons a day, about 54 tons of which have come from the stock pile. The latter will probably last into the coming summer, when, with greater drill capacity, we shall be able to increase our production gradually until the ultimate capacity of the shaft houses or of the new compressor shall have been reached. The capacity of the shaft equipped with a modern rock house depends largely upon the strength and speed of the hoisting engine, and the amount of waste rock that must be discarded at the surface. It is too early to predict what the latter factor will be in our case, but the two shaft houses should eventually be able to handle at least 800 tons each of shipping rock, other conditions being favorable. By January 1, 1908, we should be able, with our then existing facilities, to ship 800 tons of rock daily.

The total amount of rock shipped since October was 19,399.5 tons, which yielded 457,775 pounds of mass and mineral, or 278,182 pounds of refined copper, being 14.34 pounds per ton of rock shipped. The average for November and December was 15.3 pounds.

At No. 3 shaft, a modern steel shaft-and-rock house was erected and went into commission about the middle of October. It is about 28 feet by 71 feet and 9 feet by 49 feet, respectively, 87 feet high to center of sheave, 100 feet over all, and covered with galvanized iron. It has a bin capacity of 700 to 800 tons. It is provided with two 18-inch by 24-inch Blake rock-breakers and a drop-hammer. All are operated by a small steam engine. A poor rock trestle connects this building with the waste pile.

WYANDOTTE COPPER COMPANY.

This company was organized and incorporated under the mining laws of the State of Michigan in 1899. Capitalization $2,500,000 divided into 100,000 shares, par value $25 each. The realty holdings of the company consists of 1,040 acres located in Town 52, Range 36. The property adjoins the Winona mine to the northeast and carries the Winona lode for a mile and one-half or more in length besides other unidentified beds containing more or less copper values. The efforts of the management thus far have been confined to exploring the property with the hope of finding a lode carrying copper enough to develop a profitable mine. The company is exploring the Winona lode through one shaft 8x10 feet inside measurement. During 1906 this shaft was sunk 500 feet and is now down to the 10th level and 1,000 feet deep. At uniform distances in the

shaft levels were established and continued in the lode for various distances for the purpose of testing its copper bearing qualities. At present, development work is confined principally to this 10th level where systematic investigation is conducted in the most practical way. In 1906 besides sinking the shaft 500 feet, 150 feet was drifted in the lode and 180 feet of crosscuts driven cross the rock formations. About 25 men are employed and two power drills operated. The property is skillfully managed and economically operated.

Diamond drill investigation in search of the Baltic lode is to be started up this spring at Elm River and Erie-Ontonagon people and the discovering of important values in either of these properties would likely mean as much for Wyandotte as for the surrounding mines.

Surface equipment is adequate for requirements and include double hoist cylinder good for 1,000 feet, a seven-ton Burt boiler, air compressor capacity to operate a dozen drills, besides supplementary additions and dwellings for employes.

President, Henry Stackpole; secretary-treasurer, Wm. O. Gay; superintendent, F. L. Van Orden; clerk, W. C. Van Orden; mining captain, Louis La Rochelle.

ASSETS.

Deposit in banks	$26,744	
Deposit in trust companies	181	
Cash on hand	36	$26,963
Cash and supplies at mine		3,428
Accounts receivable		9,808
Total		$40,290

LIABILITIES.

Accounts payable	$ 28	
Adjustment account	5	
Draft No. 233	1,600	1,633
Net surplus		$38,656

President John C. Watson in his report to the stockholders says:

A year ago we were sinking our Winona Lode shaft with the 1,000-foot level as a goal. This point was reached the latter part of November. A plat was cut, and a cross-cut driven 83 feet to the Winona Lode, which proved to be 14 feet wide. A drift was run south-west 105 feet, and discontinued.

The north-east drift is still being driven, as we occasionally run across rich bunches of ground, particularly a rich piece of epidote carrying good copper values. The vein matter carries considerable leaf copper of no commercial value.

Diamond drilling is now under way, as are the preparations for resumption of work at No. 11 Exploration Shaft.

For further particulars see Agent's Report.

F. L. Van Orden, agent, in his report, says: "We are now making preparations to unwater No. 11 shaft, and already have a boiler on the ground. Owing to the great depth of snow, we have been able to do but very little toward opening this shaft, but from now on the weather should be milder, and better progress made.

No. 11 shaft is 350 feet deep, and was sunk on a vein that parallels the Winona Lode at a distance of 1,200 feet. The vein showed an encouraging amount of copper when first opened, and a diamond drill hole across the vein, 800 feet north-east of the shaft, showed excellent copper-bearing cores. It is our purpose to drift north-east from the bottom of this shaft toward the diamond drill hole, also to drive a cross-cut southeast to intersect a vein that was cut in diamond drill hole No. 19. I expect all this work will be under way shortly.

I have let a contract for the underground diamond drilling at the Winona Lode Shaft, and this work will be started at once. Scarcity of drill runners has delayed the starting of this work.

ELM RIVER MINING COMPANY.

This company was organized and incorporated in the spring of 1899, under the laws of the state of New Jersey, with a capital of $1,200,000 divided into 100,000 shares, par value $12 each, fully paid and issued. The company owns 2,300 acres of mineral land situated in the heart of the mineral range and in the line of the master lodes of the Lake Superior copper district. It is located some distance south of the Champion and north of the Winona mines in Town 52 North, Range 36 West.

In 1906 this company employed 25 men and drifted 542 feet in the lode, croscutted nine feet and sunk its shaft 40 feet. One power drill was operated. Nothing of unusual importance was discovered. As soon as the snow leaves the ground and conditions are right, diamond drill work will be started with the hope of finding the Baltic lode, which must run through the company's property. The discovery of the Baltic lode further south in the Lake Copper company's property would indicate that this valuable formation may continue all along through the territory extening from Champion mine into and through the Ontonagon district.

Elm River is really an exploring-development proposition and a great deal of opening work has been accomplished. The work has been intelligently conducted and executed with ability. Progress has been substantial and of the nature that counts. Shafts have been sunk, drifts and cross cuts extended into new ground and its values tested in a thorough and practical way. The company's land is crossed by the Copper Range Railroad. It carries the Winona lode and a number of others containing different grades of copper, but thus far, have been unable to discover one sufficiently rich to warrant the company in equipping the prop-

erty with a permanent plant for manipulating the product. The people behind this enterprise know the business of exploring thoroughly and do it right. They are enterprising and deserve to be rewarded.

Company has a good treasury with $120,000 on hand December 31, 1906.

The following is Superintendent Chynoweth's report for the year's operations ending March 31, 1907:

No. 1 shaft—

Fifth level north drift	107	feet
Fifth level south drift	219½	feet
Eighth level north drift	167	feet
Eighth level south drift	87	feet
Crosscut east of eighth level north drift	9	feet
	589½	feet

At the time of my last annual report we were drifting north of the shaft at the 8th level, and this level has since advanced 167 feet north and 78 feet south. The lode at these points proved to be hard, flinty and barren of copper. It was then decided to abandon the eighth levels entirely and begin the work of extending the fifth level southwest. After drifting this level in that direction a distance of 219½ feet without favorable results we turned about and drifted northeast on the course of the formation 107 feet but so far no values have been disclosed.

As soon as definite information can be secured regarding the remarkable discovery made by diamond drill on the Lake property southwest of Elm River, I advise making a thorough investigation of the lodes lying between the Winona lode and the eastern boundary of your property. If this discovery proves to be the Baltic lode it will mean much to Elm River, as it will underlie the entire property.

Main office, 60 State St., Boston; mine office, Winona, Houghton County, Mich.

H. F. Fay, president; George C. Endicott, secretary-treasurer; James Chynoweth, superintendent.

ERIE-ONTARIO DEVELOPMENT COMPANY.

The following lands are held under option by the Erie-Ontario Development Company:

Southwest quarter 28, 53, 35.
Southeast quarter 30, 53, 35.
Northeast quarter 31, 53, 35.
Northwest quarter 32, 53, 35.

H. F. Fay, president; Geo. C. Endicott, secretary-treasurer; James Chynoweth, superintendent.

The company was organized in January, 1905. A limited number of shares were sold and work began on the property in February of the same year. Several amygdaloid lodes were uncovered by trenching and test pits. None of the lodes exposed by this method of operation were of sufficient value to warrant extensive mining on them. This property was operated from January to August in 1906 and 30 men were employed. The shaft was sunk 53 feet and is now 148 feet deep. Besides this, 386 feet of drifting was done in the lode and 47 feet of crosscuts driven. For lack of funds, all work on the property has been suspended.

New developments on the Baltic lode will mean just as much for Erie-Ontario as for other undeveloped propositions.

The Winona lode outcrops on the property and finally a shaft was started at a point on the property where the lode is exposed at the surface. This shaft was sunk 100 feet. At this point a short crosscut was extended west where it intersected the lode and levels opened on its strike line a distance of three hundred feet. Some copper was discovered but not in sufficient quantities to make it of any commercial value. It is the opinion of the management that greater values will be obtained at deeper points, therefore, sinking was resumed with the intention of investigating the lode by extensive openings 500 feet deeper.

The mine is equipped with necessary machinery to accomplish the amount of work laid out. Two power drills are at work sinking the shaft which is going down very rapidly.

These lands are well located on the mineral range of what is known as the copper bearing territory which lies between the eastern and western sandstones.

Undoubtedly the Baltic lode traverses these lands, and also the vast area of unexplored territory in that district, and what is now a virgin forest will at some time in the future become great mining communities where thousands of men will be employed which will add millions of doldars to the wealth of Houghton County.

KEWEENAW COUNTY MINES.

KEWEENAW COUNTY MINES.

The total number of men employed in and about the mines of Keweenaw County during 1906 was 1,119.

ALLOUEZ MINING COMPANY.

Office, 60 State Street, Boston.

Capital Stock, Two Million Five Hundred Thousand Dollars, In One Hundred Thousand Shares of $25 Each; $22.25 Per Share Paid In.

President, H. F. Fay; Directors, A. Agassiz, F. L. Higginson, F. W. Hunnewell, Quincy A. Shaw, Jr., R. L. Agassiz, H. F. Fay, W. L. Frost, Geo. C. Endicott, James MacNaughton, of Michigan; secretary and treasurer, Geo. C. Endicott.

General manager, James MacNaughton, Calumet, Michigan; Transfer office, 60 State Street, Boston.

While Allouez is a producer of copper, it is quite a young mine in the early stages of development and has an excellent future outlook, since the beginning of operations, which was but a short time ago, it has been developed and equipped with record breaking speed. Few records surpass it. In fact, I don't know one that does. And there are still better things ahead for it. Its management has been in masterful hands and still is, who knows the business thoroughly and not only knows the business, but dispatches it in the most practical way for getting results. Nothing can illustrate this fact better than the splendid success achieved. The mine is described in my previous report.

The Company's annual statement for 1906 is issued and makes a most creditable showing. Deducting No. 2 shaft expenses and construction account, the year's operation results in making a mining profit of $223,570.88 and a net profit of $191,029.31 over all expenditures of every kind. In view of the fact that the lode was only struck in the mine on the 17th day of February, 1905, this showing is really a phenomenal one and then where the lode was penetrated, happened at a distance of 2,000 feet below the surface on the plane of the lode. The company's land contains no outcrop of the lode. During the year, 178,000 tons of rock were treated at the stamp mill from which was recovered 5,531,660 pounds of mineral and 3,486,900 pounds of refined copper. The product of copper sold for 19.5414 cents per pound. Yield of refined copper per ton of rock treated was 19 pounds. The average number of men employed was 265; number of power drills operated, 22. In all, 12 levels were extended from shaft

with average length of openings 400 feet in the lode. The product was taken from all over the mine and no particular effort was made to secure any particular grade of rock. Extent of openings are too limited for any picking or choosing to prove successful for any length of time. Ground had to be broken down as opened in order to make up the product of rock. On the 31st day of December, 1906, No. 1 shaft was 2,000 feet deep and No. 2 was 187½ feet deep. Except for a little modification, No. 2 is a duplicate of No. 1 and sinking on the same angle, which is 80 degrees from the horizontal. No. 2 is lined with cement to a point of 180 feet below the surface and this lining will make the shaft practically everlasting and is expected to keep back all surface water. During the year under review, there was drifted in the lode 2,612½ feet, crosscutted 60 feet and shafts sunk 526½ feet. Total openings, 3,209 feet. The more the annual report is looked into, the better it shows up.

At the annual meeting of the company held March 12, 1907, control of the Allouez Mining Company was transferred to the Calumet & Hecla Company and on the 1st of April following Capt. James Chynoweth resigned the position as Superintendent of the Allouez and Centennial Mining companies and was succeeded by General Manager James MacNaughton of the Calumet & Hecla Mining Co. Captain Chynoweth is one of the most competent mining men in the Lake Superior district and is splendidly equipped for managing mining operations of any description. For thirty years Capt. Chynoweth has been a prominent factor in developing and equipping mines of the copper region and has succeeded in bringing three to a producing point, either of which any manager may be proud of. I refer to Trimountain, Allouez and Centennial. From 1859 to 1900 various managements had tried to open mines on one lode after another in Allouez and Centennial, but all proved financial failures. Capt. Chynoweth was the first to open these properties on the Kearsarge amygdaloid, however. The management of the Calumet & Hecla Mining Company needs no introduction here. It is described in my previous report and elsewhere in this work. For honesty and integrity, the company is above reproach and ideal and the company's properties are managed, I believe, as efficiently as any on the globe.

The following is taken from the Allouez Company's report:

SUPPLEMENTARY TREASURER'S REPORT.

Showing a Summary of Results for the Year Ending December 31, 1906.

RECEIPTS.

From sale of copper product in 1906, viz: 3,486,900 pounds at 19.1454 cents	$667,582.18
From interest	873.80
	$668,455.98

PAYMENTS.

For working expense at the mine	$341,241.59	
For smelting, freight, cost of marketing copper and all expenses	53,554.71	$394,796.30
Showing a mining profit on No. 1 shaft of		273,659.68
Less preliminary work at No. 2 shaft		50,088.80
Showing a net mining profit of		$223,570.88
Less construction and equipment at mine		32,541.57
Showing a net profit over all expenses of every kind		$191,029.31
Add balance January 1, 1906		86,628.16
Showing balance on hand January 1, 1907		$277,657.49

Summary of results from Superintendent Chynoweth's report:

Rock Hoisted	192,752 tons.
Rock discarded	14,460 tons
Percentage discarded	.07501 tons
Stamp rock	178,292 tons
Shipped from stock pile	108 tons
Rock treated	178,400 tons
Mineral produced	5,531,660 pounds
Percentage of mineral in rock treated	.01550
Refined copper	3,486,900 pounds
Percentage refined copper in mineral	.63035
Percentage refined copper in rock treated	.00977

The copper contents of the lode has varied considerably from month to month, caused by cross courses intersecting the vein, which always has a tendency to diminish its value.

Number 1 shaft has now reached the eighth level, 2029 feet from surface, a station has been cut and drifts started north and south of the shaft and the lode at this point shows copper in paying quantities.

It was found impossible to continue work in the original No. 2 shaft, where we were operating at the time of my last annual report, owing to the abundance of surface water and unknown depth of quicksand. It was therefore abandoned and another shaft started at a point of about 600 feet to the southwest, which shaft is now 250½ feet deep. A drift 30 feet long has been opened north of the shaft and a fork sunk in the bottom of the same. Steel I-beams have been placed around the shaft, which with a course of brick 18 inches thick, forms a foundation for the concrete lining which is being laid. The shaft will be lined with concrete to a point 180 feet from its portal and this lining is expected to keep all surface water from entering the shaft, thus making rapid sinking possible.

Absalom Wearne is mining captain.

AHMEEK MINING COMPANY.

Ahmeek has decided merit and is one of the coming ones of the Lake copper district. As anticipated, 1906 was a year of great activity and progress at the mine and as a result, its physical condition has been materially improved and strengthened in every department. Through alterations made and various new additions to the mechanical equipment, the property has been practically transferred from a development proposition to that of a successful, prosperous mine. Much of the old mechanical equipment that had been rigged up for temporary use during the mine's early stages of development, has been removed to another quarter where it will go in commission again for further service. The new modern plant which has been under construction for some time and which, by the way, is one of great power and high efficiency, was practically completed and put in successful operation. In a few particulars Ahmeek's new plant differs slightly from any one in use at the other mines of the copper district. But it works very successfully and is economical in operation which, after all, is the main thing. The mechanical equipment consisting of power plants, rock-house and cylindrical rock-bin and boiler house is situated about midway between the two shafts. Power houses are built of concrete and brick; boiler house of structural steel. No. 1 power house encloses a Nordberg hoisting engine, a Nordberg 45 drill capacity air compressor and an electric light plant for lighting mine buildings and location. No. 2 power house contains single hoist for No. 2 shaft. Boiler house has five boilers with room for eight. Everything is new, of the best and arranged for economical results. The hoists are duplicates of direct action and are capable of lifting ten ton loads from a depth of 5,000 feet. Drums are double conical with maximum diameter of 18½ feet. Skips counter-balance in shafts and carry seven tons to a trip. The rock-house has a separate cylindrical steel rock bin 32 feet in diameter and 45 feet high. Foundation is concrete with railroad running underneath it so that cars may be filled from bin by gravity. Aprons are operated by a lever from the west side and works very successfully. A single man can fill a car of 40 tons in 15 seconds of time. Broken rock is conveyed from shafts over trollies to rock house when it is put through grizzles and crushers and prepared for stamp mill. The prepared product falls from crushers and grizzles into a chute from which it runs by gravity into the circulating buckets of an endless chain bucket conveyer and is lifted and dumped into the cylindrical rock bin. The whole work is done very simply and economically. The mine is rapidly coming to the front as may be readily seen by comparing the product of 1906 with that of the previous year.

	1906	1905
Tons of rock stamped	166,960	78,360
Pounds of refined copper	3,077,507	1,552,957

No. 1 shaft is 922 feet deep and No. 2 is 1,142 feet deep. About 250 men are employed on an average and at present 35 power drills are operated. 472 feet of shafts were sunk and 4,299 feet of drifts were extended in the lode during 1906. In all 11 drifts are going forward in the lode and the usual amount of new ground is being developed that contain average values. Air circulates freely through the workings, and every precaution is taken to make the mine safe and comfortable for working. Developments have been conducted on practical lines and up-to-date methods and the underground department is in fine physical form and in a condition where a substantial rock output can be produced and maintained. Rock is stamped at the Osceola mill. The mine is ably managed and economically operated. The company's mineral land forms an irregular tract consisting of 920 acres in Town 57, Range 32, adjoining the Mohawk, North Kearsarge and Allouez mines. The lodes averages 14 feet wide and underlies practically the 920 acres. Its two shafts are numbered from south to north, 1,434 feet apart and sunk at an angle of about 42 degrees from horizontal. Both are three-compartment, 17 feet 2 inches by 8 feet inside measurement with double skipways and substantially constructed. Stringers are made of concrete, which answers admirably in place of timber. The Ahmeek was the first in the district to substantiate concrete for timber. Other mines have now adopted the same material in shaft construction.

President, A. S. Bigelow; secretary-treasurer, W. J. Ladd; general manager, Norman W. Haire; superintendent, W. J. Uren; surface superintendent, Russell Smith; mining captain, Thomas Rapson; clerk, William Veale.

MOHAWK MINING COMPANY

Office, 15 William Street, New York.

Capital Stock: Two Million Five Hundred Thousand Dollars; in one hundred thousand shares of $25 each.

Officers: Joseph E. Gay, president; J. R. Stanton, treasurer; J. W. Hardley, secretary; Fred Smith, agent; Will G. Smith, superintendent; Frank Getchell, clerk; John Trevarrow, mining captain; B. S. Shearer, mill superintendent; William Hartmann, engineer.

Mohawk still holds the distinction of being the heaviest copper producer and most important mine in Keweenaw county. Such a declaration until recently, except in pioneer days, would not carry any particular significance. Destiny, however, seems to be bringing about for this section a new era of far greater industrial development and expansion than it ever enjoyed even in its years of greater activity and popularity. The time may not be far away when to hold first place even among Keweenaw mines may be a distinction worth striving for. Indications seem to point that way and in no uncertain manner. Mohawk is practically a new mine

with a splendid record for doing things right and in the best way for getting out of the property the best there is in it. The mine is opened up and developed for years ahead and on the most practical up-to-date methods. Things are not done in a hand-to-mouth way here. Underground openings from the northern to the southern extremity and are well on to 8,000 feet in length. Great blocks of lode ground that will make fine stopes are opened up in the most business-like way for economical extraction and away ahead of production. The physical condition of the property is excellent and it is in a position to furnish a heavy rock output carrying the usual values belonging to the lode without running the least risk of robbing the reserves of ground. The company has spent big sums of money in the work of opening up and equipping the mine and it is provided with the very best of machinery for manipulating the product. The policy of expansion and enlargement for still bigger and better things will be maintained and the position of the mine strengthened from time to time. Future requirements are anticipated and provided for in season. Every department is in first class trim and running satisfactorily. Mohawk forms a first rate example for a well managed mine and splendidly illustrates what substantial profits may be made in mining a lode carrying small copper values when operated on up-to-date methods. In the past couple of years the yield of copper recovered from the rock treated has been disappointing, but the mine openings should soon be getting down to a plane where better values may again be expected. Kearsarge lode, which the company mines, is something of deep level proposition. The company's annual statement for 1906 reflects a year of fine management and in view of the low percentage of copper recovered from the rock treated, splendid results. It may be noted that the yield of copper per ton of rock as against 16 pounds for 1905 and 17.7 pounds treated in 1906 was but 15.1 pounds for 1904. The compounding of the third stamp head to be followed by that of a fourth will enable the management to treat a much larger tonnage of rock during the coming year than was treated during 1906 and 1907 should easily be Mohawk's banner year. During 1906 the company employed 800 men on an average and operated 65 power drills.

The mine was opened in 1898 and paid its initial dividend in 1906. Another dividend of $3 per share was paid July of the same year and one of $4 per share was paid January, 1907. Total dividends paid to date, $900,000 or $9 per share.

Aggregate opening work done in 1906 was:

Shaft sinking	637.1
Drifting on lode	12,677.5
Total	13,314.6

Stoping in fathoms, contributary to the different shafts was as follows: North of No. 1, 5,939.1; south, 5,101.2; north of No. 2, 5,921; south, 3,734.4; north of No. 3, 3,946.4; south, 2,540.2; north of No. 4,

2,905.6; south, 4,214.6; north of No. 5, 1,079.6; south, 778.5, making total stoping 36,160.6 fathoms. The rock hoisted during the year was 703,771 tons, of which 85,228 tons were discarded as poor, equal to 12.11 per cent. Rock transported to mill and stamped was 618,543 tons, yielding 12,723,515 pounds of mineral which at .756 per cent, gave us 9,352,252 pounds of refined copper. The average return of refined copper per ton of rock stamped was 15.12 pounds, and per ton hoisted was 13.29 pounds.

The directors' report of operations during the year 1906:

RECEIPTS

Sales of copper, 9,352,252 pounds at 19.60 cents	$1,832,765.96
From interest	9,575.07
	$1,842,341.03

EXPENDITURES

Working expenses at mine	$884,712.69	
Smelt., fr. c. of mark'ng cop. and all other expenses	100,452.73	
Total working expenses		$ 985,165.42
Mining profit in 1906		$ 857,175.61
There has been expended for construction		93,873.51
Making the net gain in 1906		$ 763,302.10
Sur. Dec. 31, 1905	796,114.42	
Less div. Jan. 10	$200,000	
Less Dividend July 10, 1906	300,000 500,000	296,114.42
Making the net surplus Dec. 31st, 1906		$1,059,516.52

As shown in the annexed statement of the assets and liabilities, and out of which a dividend of $400,000 was paid January 10th, 1907.

Assets and liabilities December 31, 1906:

ASSETS.

Cash in bank	$ 41,401.58
Cash in Trust Company	470,000.00
Copper on hand sold	527,894.31
Cash and supplies at mine	79,838.84
Stock in Michigan Smelting Co.	80,000.00
	$1,199,134.73

LIABILITIES.

Indebtedness at mine	$124,857.40	
Accounts payable	14,860.72	
		139,718.21
Balance of assets		$1,059,416.52

SUMMARY OF RESULTS.

Rock hoisted	703,771 tons
Rock stamped	618,543 tons
Product of mineral	12,723,515 lbs.
Product of refined copper	9,352,252 lbs.
Yield of rock treated is 15.12 lbs. per ton or 756 per cent.	
Cost per ton of rock hoisted	$1.257
Cost per ton of rock stamped	1.430
Cost per pound of refined copper at mine	9.46
Cost of smelting, freight, and marketing product, including office expense	1.074
Total cost per pound refined copper, cents	10.534

Total cost per pound of refined copper, including construction, 11.54 cents.

Mohawk mine is described at some length in my previous report.

KEWEENAW COPPER COMPANY.

Office: 45 Broadway, New York. Capital stock, $2,000,000.00; $10.00 per share paid in; $25 per share Par Value.

Officers: C. A. Wright, president; Thomas Hoatson, second vice-president and mining director; Spencer R. Hill, vice president; C. A. Wright, Jr., Secretary and assistant treasurer.

The property of this company is located in Keweenaw County, which is without doubt one of the coming districts of the Upper Peninsula of Michigan and destined to become in the very near future, a lively place. During the year under review, a heap of practical work was dispatched and substantial progress made both at the mine and with the Keweenaw Central Railroad. All the Railroad stock, and it forms a valuable asset, is owned by the Keweenaw Copper Company.

The lands owned by the company comprise a vast acreage consisting of upwards of 17,000 acres—approximately 27 miles of territory. Much of this land is well timbered and certain to appreciate in value now that it has a railroad. Moreover the lands reach from one side of the mineral Range to the other and encompass all the copper bearing lodes in the district. The undeveloped possibilities of such a property is prodigious and practically beyond mathematical computation. Cross sections of the land have been investigated with the diamond drill and the result is that various lodes as they exist further south in Houghton County, have been located and identified. Many of the diamond drill cores show healthy vein matter and contain good copper values. The best showing made thus far is in the Medora lode in which the company has under development a mine with decided merit and distinct future promise.

Just recently, I made a couple of visits to the mine and in company with its general manager, Capt. Thomas Hoatson, went underground on both occasions. We went through the mine and examined the lode exposures in all the openings and I must say with all earnestness that the proposition looks well to me. The Medora lode in this property is a strong amygdaloid, well organized, with bright, heavy strong copper showing in places clear across the formation from footwall to hanging wall. It has a healthy appearance and averages about 12 feet wide. In some particulars, it resembles the Kearsarge Amygdaloid with its chocolate brown color and shot copper showing up frequently. A number of holes were exploded just before we went underground, which afforded a fine opportunity to examine the broken rock while it was fresh and clean. A good deal of this rock contained good copper values and should turn out well in the stamp mill. It is comparatively soft and a modern stamp head will crush a heap of it in 24 hours. The lode is essentially a stamp mill proposition showing up the different grades of copper. If it develops equal values in depth, and I don't think there is much doubt about this, as there is new showing practically all through the openings, the property ought to form a substantial, profitable mine. The best I saw was in the bottom of the shaft over 500 feet below the surface on the plane of the formation. Of course the lode is not rich all over. Like other amygdaloids, it has its patches of poor ground. In my opinion, however, it will return values that should compare favorably with the average amygdaloid veins worked in Houghton County.

There are two shafts underway. One is just started while No. 1 is 500 feet deep with lateral openings as much as 175 and 200 feet each side of shaft. When finished it will be a three-compartment and among the best shafts in service anywhere. Main levels are established 150 feet apart with intermediate sub-levels. On account of the flatness of the lode sub-levels are used for facilitating the removal of broken rock from stopes accessible points for trammers, and will no doubt answer well. Everything looks first-rate for a new mine and good progress has been made. Development work is conducted on modern methods and large blocks of ground are forming that will make good stopes and turn out well. The management knows the mining business and is doing it right for getting the best results. Whenever production may be started up, everything will be in ship-shape. As soon as the snow melts, another new shaft will be started about 1,000 feet west of the present one. During the coming summer, the mine force will be increased and operations pushed ahead with great vigor, and the mine opened up and developed with all possible speed. Everybody on the ground is optimistic on the property's outlook and good feelings exist all over the location.

James T. Bryant is mining captain; A. H. Sawyer, chief engineer.

Keweenaw Central Railroad now makes daily runs from Calumet to Mandan, a distance of 19.7 miles. There is nothing in the world that

develops the resources of a country like a railroad and Old Keweenaw County's best days are to come. Keweenaw Central passes within easy reach of all the mines along the line, and is practically sure to do a large freight and passenger business. For a new road, it runs smoothly and the service is good. Keweenaw County is a favorable resort with Copper Country people and during the summer seasons, especially, and particularly on holidays, the passenger capacity of the road is likely to be taxed to its utmost.

John C. Shields is General Superintendent.

President C. A. Wright's report of the operations of the Keweenaw Copper Company during the year 1906:

The Keweenaw Copper Company has conducted with encouraging results a large amount of work during the past year in its plan of development of some of the numerous copper bearing beds, existing on its extensive holdings of mineral lands.

To obtain knowledge of the location of these beds, and their general characteristics, 12,532 feet of diamond drilling was done during the year, giving complete cross sections of some of the Company's most important properties, and much valuable information proving the existence on the land of the Company, on a strike line several miles in length and of ample depth for deep mining, of several of the more important mineral beds of the district, including Calumet & Hecla, Allouez, Kearsarge and Houghton Conglomerates, and Kearsarge, Osceola, Montreal and Medora Amygdaloids. These beds have been identified by Dr. A. C. Lane, State Geologist of Michigan, who examined about 10,000 feet of diamond drill cores for this company, and states that they would average about the same as the same amount would in Houghton County. Cores from nearly all the beds mentioned showed some copper, and that the beds were generally about the same thickness as those farther south among the producing mines. Perhaps the best showing of copper in the cores was the Calumet & Hecla Conglomerate, the Montreal Amygdaloid and another Amygdaloid which was one of a large number of unnamed Amygdaloid beds penetrated by the diamond drill, some of which showed copper.

Of course the diamond drill proves nothing as to the value of these beds; but it has proven beyond doubt that in a large amount of drilling, over 12,000 feet, the cores in Keweenaw County will average about the same as in Houghton County, that the beds have about the same thickness and general character as in Houghton County and that they carry copper, that the 17,000 acres of mineral lands belonging to the Keweenaw Copper Company are traversed by the principal copper producing beds of the district and others of possible value with sufficient indications of the existence of copper in commercial quantities to warrant further development by the Company.

Owing to the very favorable showing in the Medora Amygdaloid bed the mining operations of the company have been confined almost entirely

to the opening of the lode. This work, including the installation of equipment and general surface improvements, has been under the supervision of Captain Thomas Hoatson, mining director, and the immediate direction of A. H. Sawyer, chief engineer, whose reports follow.

The capital stock of the company has been increased during the year from 150,000 shares to 200,000 shares, for the purpose of acquiring about 9,000 acres of additional mineral lands adjoining those previously held, and the company now owns 17,000 acres of mineral lands in Keweenaw County. All of the stock of the company has a paid in value of $10 per share. Par value, $25 per share.

The Keweenaw Central Railroad Company, whose capital stock amounting to $500,000 is wholly owned by the Keweenaw Copper Company, now owns twenty-six miles of standard gauge railroad track partially equipped. Regular trains have been operating daily between Mandan and Mohawk, twenty miles, since January 1, 1907, and by a recent trackage arrangement over the Mineral Range Railroad are now running through to Calumet. The railroad company at present has no bonded indebtedness It will probably construct some additional track during the present year and make some necessary additions to the equipment.

Captain Thomas Hoatson, mining director, reports for the year 1906:

Complete cross-sections, south of the Greenstone, have been made at the Mandan and Empire properties. In addition, several holes have been drilled at other points on the Mandan and Resolute properties locating and testing the Montreal Lode and Calumet Conglomerate.

The cores of several of the lodes traversing the property look well and warrant further work and it is our intention to sink at one or two points in the early spring.

A pit is being sunk on the Empire to expose the Montreal Lode and will reach ledge very shortly. As the drill-cores were promising at this point, it is probable that a shaft will be started here in the near future.

Number 1 shaft on the Medora Lode has been sunk to a depth of 390 feet and main levels are being opened at 225 feet and 375 feet respectively. It is our intention to drive the main levels at intervals of 150 feet and sub-levels at points midway between.

The first level has been driven 115 feet east and 71 feet west of the shaft. The second main level has just been reached and work here will be pushed both east and west as rapidly as possible. The sub-levels will not be opened up until later.

It is our intention to sink to a depth of at least 600 feet when all ten drills (our present capacity) will be employed in drifting.

All of the opening in the mine have shown up well thus far. If they continue to look as well to the westward, a shaft will be started at some point 1,500 to 2,000 feet west of No. 1 shaft. Nothing was done towards this end last fall as the overburden is considerable.

The lode is of good width and well charged with copper especially for about two or three feet from the foot-wall, where much heavy copper has been taken out.

At a point in the shaft, 340 feet in depth, a crossing was cut, which has thrown the lode about 8 feet into the hanging so that the richer portion, which has been in the foot, is now in the hanging of the shaft. There is evidence, however, of this dropping back again to its normal position.

We have on the stock pile, 7,500 tons of stamp rock.

I am much pleased with the character of the rock exposed in the workings and believe that the future of the mine is most promising.

PHOENIX.

Was organized under the mining laws of the State of Michigan in April, 1899, with an authorized capital of $2,500,000, divided into 100,000 shares, par value $25 each.

John R. Stanton, president; secretary-treasurer, J. Wheeler Hardley; agent, Frank McM. Stanton.

Eastern office, 13 William Street, New York. Mine office, Keweenaw County, Michigan.

The property of the Phoenix Consolidated Copper Company is situated in Town 59 North, Range 31 West, and consists of 2,505 acres lying on the slope of the Mineral Range and embraces three old mines, namely: Phoenix, St. Clair and Garden City, besides a tract with a mile and one-half frontage on the shore of Lake Superior adjoining the port of Eagle Harbor.

Unable to pay expenses, the property was closed down in 1905. In January, 1907, an assessment of $1.50 was levied. The money derived from this assessment will be used to pay off debts of the company, which amount to $120,000 and leaves a balance.

It is said that very little could be done with the property while in debt, but that with the railroad now passing through the location, and free from debt, better results can be obtained.

The calling of an assessment of $1.50 per share by the Phoenix Consolidated Mining Company makes the total paid in on the capitalization of the company $13.50 per share, or a grand total of $1,350,000.

It is understood that the assessment which has just been called is for the purpose of liquidating the company's indebtedness, of which there is now outstanding in excess of the amount of the assessment.

The company has sold most of its equipment in parcels and the saleable assets have been very largely converted into cash.

The floating debt of the company at the time of the last annual report to the State of Michigan showed $159,816.

The settling of the company's affairs is very generally believed to portend its transference to other hands.

The efforts to make a mine out of the 2,505 acres of Phoenix lands resulted in failure. The St. Clair fissure vein, on which the operations of the company were based, proved lean and hard with the copper very bunchy and the streaks of mineralization sparse.

In the old days it was a large producer of mass copper and has in more recent times produced small lots of metal. In 1905 its production was 273,219 pounds. This year it has been scarcely worked at all, save in the clearing out of some old stopes by three or four men employed on the property.

By an entirely friendly arrangement the control of the Phoenix Consolidated Copper Company has been turned over by the Stanton interests to the Keweenaw Copper Company dominated by the Cole-Ryan people.

About a year ago Keweenaw secured control of the Washington property, which adjoins the Medora of the Keweenaw Company. John R. Stanton has been succeeded in presidency of the Phoenix Consolidated by President C. A. Wright of Keweenaw, although he remains temporary a director.

The Phoenix was shut down June 15, 1905, and since that time there has been practically nothing doing on the property. The company had a debt of about $120,000. From an assessment recently called about $70,000 has thus far been raised and the differences between the two amounts has been guaranteed by the new purchaser so that the debt can be liquidated. It is proposed by the new management to commence exploration work on the Phoenix during the coming fall.

PHOENIX CONSOLIDATED COPPER COMPANY, ASSETS AND LIABILITIES.

December 31, 1906.

ASSETS.

Cash	$ 869.95	
Stock owned by company	6,983.43	
Accounts receivable	3,151.94	$11,005.32

LIABILITIES.

Loans	$119,477.69	
Accounts payable	995.54	$120,473.23
Excess of liabilities		$109,467.91

CLIFF MINE.

This mine, from which was taken more silver, it is claimed, than any other copper mine in Michigan, was first operated in 1846. From 1846 to 1853, sales of copper from this old mine netted, $1,328,406. Dividends paid during the same period amounted to $462,000. The depth attained was 462 feet and length of lateral openings about 1,200 feet. Owing

to the impoverishment of the lode in the bottom levels, work was discontinued in 1870. From the beginning of operations up to this period, the company had paid to stockholders $2,627,660 or a little over 200 per cent on the paid up capital. Two years later, in 1872, the mine was unwatered and started up again under a new organization, which continued until 1887, when all work was discontinued and the shafts allowed to fill with water. The Tamarack Mining Company now owns the Cliff property and it has recently been conducting some diamond drill work there for the purpose of learning with some degree of definiteness what values the lodes underlying the property may contain at moderate depth.

The company is now opening up this property and putting it in thorough repair for active operations. About 20 men are employed and the appearance of the property is beginning to reflect the result of practical intelligent management.

SENECA MINING COMPANY.

A. S. Bigelow, president; W. J. Ladd, secretary-treasurer.

Office, Boston, Mass; Capitalization, $1,000,000; par value, $25.

Lands are located north of Mohawk and Ahmeek mines. Lands consist of 1,800 acres, situated in Keweenaw County and undoubtedly hold important values. This property has been idle for many years, but the company intends to open it up the coming summer.

MISKAWABIC MINING COMPANY.

This is a development association formed for the purpose of exploring a large tract of mineral land located in Keweenaw County. The property consists of some 1,000 acres and possesses the Kearsarge lode on its strike for a mile and one-half or more in length and in all probabilities other unidentified mineralized deposits. The association has been carrying on extensive exploratory work on the property in search of the Kearsarge lode carrying values sufficient to make a profitable mine. The work has been conducted on practical lines and substantial progress has been made. Nothing showing distinctive values, however, has been discovered although what was thought to be the Kearsarge lode was uncovered in three or four pits. A shaft was sunk 170 feet deep and drifts extended from both ends for considerable distance without finding anything to warrant continuing the drifting. The Kearsarge lode is a deep level proposition and in places, like a "Will-o'-the-Wisp." From bottom of shaft, a diamond drill was then run down 500 feet deep without encountering the Kearsarge lode. Property is well located and a little persistent search should bring its reward.

Conglomerate Mining Company, embracing the old Northwest, Pennsylvania, Delaware, Mindola, New Jersey, Maryland and Wyoming proper-

ties and the Central Mining Company's property have been absorbed by the Calumet & Hecla Mining Company; the Old Cliff by the Tamarack Mining Company. The Resolute, Mandan, Medora and a number of other different properties now form a part of the Keweenaw Central.

And word has just be received that the Washington property has also been absorbed by the Keweenaw Central. The Washington property has a large area in which it is possible for copper values to be found, and a mill site of considerable value.

ARNOLD MINING COMPANY.

Was incorporated under the general mining laws of the State of Michigan in 1864, and capitalized in $2,500,000, divided into 100,000 shares of a par value of $25 each. Issued, 60,000.

The property consists of 3,323 acres of land in Town 58 North, Range 30 West, Keweenaw County, Michigan. Its holdings are divided into two groups known as the Copper Falls mine and the Arnold; Copper Falls having been absorbed in 1898. Copper Falls was extensively worked in former years and produced 12,843 tons, 429 pounds, and paid dividends to the amount of $100,000. The Arnold property was developed on an ashbed amygdaloid of low grade. Has been idle since 1901.

President, C. Howard Weston; Agent, Wesley Clark.

Main office, Boston, Mass; Mine office, Copper Falls, Mich.

HUMBOLDT COPPER COMPANY.

Lands of this Company lie just west of the Arnold and comprise 1,103 acres of mineral land. Capitalization, $1,000,000. Number of shares, 40,000, of par value of $25 each. Mine has been idle since 1901.

President, John C. Watson; secretary-treasurer, John Brooks; superintendent, Wesley Clark.

MEADOW.

The Meadow adjoins the Humboldt and Phoenix properties. Lands 364 acres. Has been slightly prospected.

President, W. F. Fitzgerald, Boston, Mass.; Agent, Wesley Clark, Copper Falls, Mich.

ASHBED MINING COMPANY.

President, C. Howard Watson; secretary-treasurer, John Brooks; superintendent, Wesley Clark.

Main office, 50 State Street, Boston; Mine office, Copper Falls, Mich.

Company was organized under the laws of the State of Michigan in 1880. Capitalization, $2,500,000, in 100,000 shares of $25 each.

This company owns 1,143 acres of land carrying the outcrop of the Ashbed amygdaloid lode in which the mine is opened, and various other cupriferous deposits. The lands are well located and posses many interesting features such as are found in association with some of the most successful mines in the region. They may contain important values and are certainly worth investigating. The work of exploring the property is conducted on conservative lines and in the most practical way for bringing the desired results. In view of the small number of men employed, a heap of work has been dispatched and of the kind that counts. The general appearance of the location shows much improvement and what can be done when directed by experienced, practical management that knows the business. Development and investigation work is conducted through a shaft 8 by 10 feet in dimensions and down 210 feet below the tunnel. In 1906, the shaft was sunk 100 feet and during the same period 1,400 feet were drifted in the lode and 100 feet of cross-cut extended. In all, five levels were extended in virgin ground with openings aggregating 2,500 feet in length. About 18 men were employed and three machine drills were operated. In addition to this opening work, some stoping was done at different points for the purpose of testing the values contained in the ground opened for investigation.

Superintendent Clark has had many years of experience with Keweenaw mineral beds and knows them perhaps, as well as any man living and just as well where to look for copper. During the year under review, some nice bunches of copper bearing ground were run into that will compare favorably with many lodes mined in Houghton County. The property is well managed and in an economical way. No report was issued by the company for 1906.

ONTONAGON COUNTY MINES.

ONTONAGON COUNTY MINES.

EARLY WORK ON THE BALTIC LODE.

Alfred Meads writes interestingly to Editor of the Herald of Ontonagon relative to early work in the Baltic lode formation.

In a letter to the Ontonagon Herald, Alfred Meads, writes as follows concerning the early operations on the south range sandstone formation in that county:

The location by diamond drill work at the Belt mine of the southern belt of sandstone and the Baltic copper lode, bids fair to revolutionize the copper mining industry of Ontonagon county. The so-called new find is on the southeast forty of the southeast quarter of Section 31 and the trend of the formation carries it across the southeast forty of the southeast quarter of Section 4, one mile to the southwest of the Belt mine, where the old Toltec Mining company owned three quarter sections of land, being the north half and southwest quarter of Section 4, now owned by me, together with the old mine (a section of land in 25 and 26), the Adventure mine intervening between it and the land in Section 4.

That the Baltic lode can be located accurately between the Firesteel and Flintsteel rivers admits of hardly any doubt, as it has been located and worked in years gone by by old explorers and mining companies. It is not a new find by any means. It was known and worked upon by the old explorers Brown, Ward, Lauer and others, and some of the younger generation of explorers and miners—Jackson, Morgenroth and the Trevarrow boys would be able to locate and identify it on several of the old locations.

My attention was called to it when I became interested as part owner and agent of the Bohemian mine before I sold it to the Belt company in England, by that veteran explorer, William Brown. He assured me that he had a good copper vein on the Bohemian property on what he called the Red Trap range in contradistinction to the Gray Trap range on which all other copper mines on Lake Superior were being worked. Brown brought me good samples of copper bearing vein rock and I sent my mining captain, John Trevarrow, out with him to make an examination. He reported that the vein was in place and also brought good specimens of vein rock. I afterward had some exploratory work done upon it, but as the vein rock samples were entirely stamp copper we did no further work upon it as in those days we had no use for copper veins that did not carry copper in mass or barrel work. Our stamp mills of those days being primitive affairs of two or four heads of Cornish stamps.

The Baltic lode can be found, opened at the Belt, Indiana and Firesteel mines to the northeast and at the Evergreen to the southwest, and will bear very near the same relation to the sandstone belt as found by the diamond drill work recently at the Belt mine. The Adventure should get it but at great depth. The Mass is reported to be about to drill for it on the Riddle farm on Section 18, where it will undoubtedly be found or on its land to the north.

Should these exploratory operations prove the Baltic lode to exist within this territory and well mineralized, the group of properties known as the Belt, Aztec, Toltec, Adventure and Mass should be consolidated into one organization and would make one of the largest and richest copper mines on Lake Superior.

Hoping that the days of experimental mining in Ontonagon county have passed and that better prospects are in store for these famous old copper producing mines, as I am a firm believer in their great mineral wealth, I await with confidence their future development.

The total number of men employed in and about the mines of this county during 1906 was 1,074.

LAKE COPPER COMPANY.

Officers and directors: Reginald C. Pryor, William D. Calverly, B. F. Chynoweth, John H. Rice, R. M. Edwards, Deen Robinson, E. M. Ingram.

This company employs from a dozen to twenty men for all purposes and operates one power drill. A new shaft was started in 1906 and it is now 650 feet deep in a copper bearing amygdaloid lode that looks first-rate. Lateral openings in the formation aggregates something over 300 feet in extent. For the entire distance sunk and drifted in the formation, the showing is uniformly good. The lode is a strong, healthy looking one, well defined and nicely charged with heavy copper from wall to wall. People who ought to know estimate that copper enough was taken out in doing the opening work to pay for all expenses thus far incurred in operating the property. In addition to this opening work, the management conducted some diamond drill work boring and succeeding in locating, it is confidently believed, a continuation of the Baltic lode in the old Belt location, which is included in the Lake Company's property. Four cores showing copper and indicating a strong lode were recovered. A director of the Company informed me one core indicated a lode 45 feet wide and that the management estimated it to contain two per cent of copper. This disclosure may mean much for the future of Ontonagon district and also for the property further north in Houghton County. Nothing, however, will prove sufficient to establish the identity of the deposit but a shaft sunk to and into it. This, the management plans to do as soon as the weather will permit. I shall not be surprised in the least if Lake people should succeed in opening

up a valuable deposit of copper, where the diamond drilling was conducted for the lay of the land looks good and just right for the disposition and concentration of mineral. Developments at the new find will be watched, from all over, with the keenest of interest.

The Lake Copper Company was organized in November, 1905, under the mining laws of the state of Michigan and was capitalized for $2,500,000 divided into 100,000 shares of par value of $25 each. The property owned by the Lake Company was formerly the old Belt of Ontonagon County, but reorganized and incorporated for the purpose of acquiring, exploring and developing and operating this property. The realty holdings of the company consisting of 720 acres, are large, and located in the direct line of the principal copper bearing lodes of the Ontonagon district. The Knowlton, Evergreen and other lodes stretch through the lands of the company for a mile or more in length and shafts can be sunk on them to great depth and worked on a large scale. Of course, the values must be developed. Adventure, Mass and Michigan—all three are mining the Knowlton lode with fair prospects for developing profitable mines and good business enterprises. The Knowlton, it might not be amiss to remark, is a great big lode apparently thrown together with but little regard for uniformity. It runs from a few feet to as much as fifty feet wide averaging, perhaps, twenty feet with the copper contents occurring sometimes in one part and then again somewhere else. With a view to locating the best bunches of ground contained in the copper lodes to be tested and developed, the company has decided to do most of the exploring work with the diamond drill and by trenching. The people behind the enterprise are mostly local and well skilled in the most practical and successful methods for developing new propositions. With the average values of the district located, the organization should be a decided success. The future outlook for the proposition looks promising, and it has been planned to give it a practical trial on modern methods of mining. The work will be conducted under the management of Reginald Pryor.

ADVENTURE CONSOLIDATED COPPER COMPANY.

Organized under the mining laws of the State of Michigan, October 17, 1898. Capital stock $2,500,000 in 100,000 shares of $25 each.

Vice president, James L. Bishop; secretary-treasurer, Wm. R. Todd; assistant secretary-treasurer, W. A. O. Paul; superintendent, Samuel Brady. Main office, No. 32 Broadway, New York; mine office, Greenland, Mich.

Adventure Consolidated in one of the oldest mines in the Ontonagon district, and in early days formed quite a factor in the copper district. Mine location is situated at Greenland, Mich., in Sections 35 and 36, Town 51 and Range 39, and in Sections 1 and 2, Town 50 and Range 39 and consists of 1,706 acres of mineral land besides a mill-site of 320 acres

on which the company has a modern stamp mill. About 335 men are employed and 31 power drills operated. Average length of openings in the vein is 1,000 feet.

Following is a comparrison of results for three years:

	1906	1905	1904
Received from sales	$292,822	$252,572	$188,149
Running expense	281,964	295,984	241,332
Taxes	8,213	9,550	11,132
Smelting, transportation, etc.	21,583	21,492	25,789
Deficit	18,939	74,455	90,104
New No. 4 shaft	26,641		
Total deficit	56,019		
Stock instal.	53,914		
Sur. Dec. 31	51,648	53,753	

In 1906 there was stamped in the company's mill 136,094 tons of rock from which was recovered 2,452,062 pounds of mineral, which yielded 1,552,628 pounds of refined copper. This compares well with 130,985 tons of rock treated in 1905 and 1,606,208 pounds of refined copper recovered. Improvements underway include an electric haulage from No. 4 shaft and changing rock house for more economical handling of rock.

Boston—The Adventure Consolidated Copper Co. balance sheet as of Dec. 31, 1906, shows:

ASSETS.

Cash and copper and accounts receivable	$41,200
Assessments unpaid	2,292
Cash at mine	1,843
Supplies at mine	37,977
Accounts receivable at mine	6,390
Total	89,705

LIABILITIES.

Labor and other accounts payable at mine	$32,900
Payable in New York	5,156
Total	38,056
Bal. assets Jan. 1, 1907	51,648

The average price received by the company for its copper in 1906 was 18.85 cents per pound.

The mine is developed and operated through three shafts, Nos. 1, 3 and 4 are sunk on the Knowlton lode, although the bulk of the product comes from No. 3. During 1906 a limited amount of work only was done in No. 1 while No. 4 is practically a new shaft. The property is crossed by a number of copper bearing belts, most of which have been explored and investigated from time to time. Superintendent Brady gets the best results from the Knowlton, and practically all recent developments have been conducted in that formation. Like most of the amygdaloid beds of

the region, the Knowlton is a strong, but irregular lode, with the best copper values making in bunches separated by bars of unprofitable ground, varying in extent. To secure the best results large reserves of ground must be opened up and developed ahead. Miners may then be distributed throughout the openings and select copper bearing courses to the best advantage. There is nothing like a few held in reserve when a lode is bunchy and irregular. No. 1 shaft is 8 feet by 20 feet in dimensions, three compartment and 765 feet deep; No. 3 is 8 feet by 18 feet, three compartment and 1,215 feet deep and No. 4 shaft is 694 feet deep and the same size as No. 1. Nos. 1 and 2 shafts are connected underground and ventilation is good.

The following is a summary of openings made in 1096:

SHAFT SINKING.

Number three shaft, 136 feet deep to a total depth of 1,215
Number four shaft, 515 feet deep to a total depth of 694

Total 1,909

DRIFTING ON THE KNOWLTON LODE.

Total number of feet..... 3,426.5

NO. FOUR SHAFT.

2nd level east ..... 297.
2nd level west ..... 24.
3rd level west ..... 84.
3rd level east 189.5
4th level east ..... 14.
4th level west ..... 56.
5th level west ..... 10.
5th level east ..... 10.

Total for No. Four shaft 684.5
Total drifting ..... 4,111 feet

CROSSCUTTING NO. THREE SHAFT.

Crosscutting sixth level west, south of Evergreen..... 93.5

NUMBER FOUR SHAFT.

Total crosscutting ..... 238.

Total 331.5

The usual amount of opening work is underway developing fresh reserves. The lode in No. 4 has looked very good from the start. It is unusually wide and fully as rich in the different grades of copper as the average of the mine. Tributary to No. 3 the lode carries average values, perhaps a little better. Surface equipment is powerful, practically new, very complete and good for years to come. The company's stamp mill is 135 by 217 feet in dimensions, built of steel, and located at Edgemere,

on the shore of Lake Superior. The site is an excellent one with water the year round. The mill is equipped with three heads and the necessary fittings and appliances for washing and dressing copper. Buildings and locations are lighted by electricity. Both mine and mill locations are provided with a number of comfortable dwellings for the use of employes. The property is well managed and economically operated.

THE MASS CONSOLIDATED MINING COMPANY

Main office, No. 6 Beacon Street, Boston, Mass. Mine office, Mass City, Michigan.

Capital stock, Two Million Five Hundred Thousand Dollars, in one hundred thousand shares of $25 each. Capital paid in, one million nine hundred thousand dollars.

Officers: President, Charles A. Lamb; vice president, Geo. A. W. Dodge; secretary-treasurer, Wilfred A. Bancroft; mine superintendent, James M. Wilcox.

The property of the Mass Consolidated Mining company is described in my previous report. Since its publication, no material change, so far as I know, has taken place in the physical features of the property nor has the methods in use for taking out the product undergone any marked modifications. Lands owned by the company consist of 2,400 acres stretching almost across the entire mineral belt and must of necessity contain practically every copper bearing lode existing in the Ontonagon district. The company is mining the Knowlton and Evergreen lodes through four substantial shafts known as shafts A., B., C. and D. These lodes are strong, healthy formations and well defined, but low grade and irregular with the copper values making in pockets separated by bars of lean ground. In some parts of the mine, these pockets of copper are found close together while in other places again they are wide apart.

The company has issued its annual report for 1906. In view of the high prices received during the year for the product of copper, the report is disappointing and falls short of what the public and friends of the company had expected. The company produced 2,106,739 pounds of refined copper, which was sold for 19.5 cents per pound. Though the product brought such a splendid price, the year's work resulted in a net loss of over $100,000. Of this amount, however, $42,388 was spent for betterments, the purchase of additional real estate and for doing exploring work. The poor showing for the year is attributed to a material falling off in the amount of mass and barrel copper contained in the lodes and the low percentage of mineral recovered from the rock treated in the stamp mill, while the monthly product of mass and barrel copper averaged only about 18 or 20 tons during 1906, formerly, it reached as much as 80 or 90 tons. This is an important condition of affairs and may well occasion serious consideration. After discarding over 20 per cent of the rock broken un-

derground and hoisted to surface the yield of copper was but a small fraction over 11 pounds per ton of rock treated. This is pretty low grade stuff and it is next to impossible to operate such a proposition and make both ends meet. Should the lode recently located on the property of the Lake Copper company happen to be the Baltic lode, as a good many people seem to think, it would prove one of the most important discoveries thus far made in the entire copper region of the Lake Superior district. Its values to the mines of Ontonagon district and also to the properties located further north in Houghton county, but south of the Copper Range mines, would prove practically beyond computation. Some good judges of copper lodes and who ought to know the Baltic lode rock when they see it, seem to have but little doubt regarding its identity. A director of the Lake Copper company told me they secured 4 diamond drill cores from the new find in their property. All 4 cores are copper bearing while one was estimated to contain as much as 2 per cent copper. And where the cores were taken from the lode it is 40 feet wide. That certainly looks encouraging. The Baltic lode is a great big, healthy formation and if it extends from the Superior mine through Baltic, Trimountain, Champion and along to the Lake Copper company's property, the probabilities are that it continues still further on through the lands of Adventure, Mass, Michigan and other properties further south yet. As soon as the snow disappears and the weather permits, Supt. Wilcox, I understand, will start to explore for this lode. The move is a commendable one for such a deposit is worth looking for.

The mechanical equipment of the company is in good running order and doing satisfactory work.

Following is a copy of the Company's report for 1906:

President Lamb says in part in the Mass mine annual report:

We regret that our expectations of the mine's output for the past year have not been realized, but we have reason to hope for greater improvements the coming year.

We have and shall continue to employ all labor saving devices at mine and mill, that our expenses may be materially reduced. As mentioned in Supt. Wilcox's report, shaft houses "B" and "C" have been equipped so that the labor has been reduced one-half. In September the Michigan mine released our No. 2 stamp, thus giving us the opportunity to make necessary changes and repairs prior to putting the stamp into commission with Mass rock. The aim of the management for the past year has been toward new development, thereby increases reserve ground. While showing increased costs, for the time being, we believe the wisdom of such an expenditure will be shown in future operations.

Cash assets on hand January 1, 1906 ..... $257,239.40

RECEIPTS.

2,106,739 pounds of copper, average price .1952c.	$411,220.95	
2,365.27 ounces of silver at 70 cents	1,666.08	
Interest	3,744.21	
		416,631.24
		$673,870.64

EXPENDITURES.

Expenses as per detailed statement	$400,909.94	
Freight on rock and mineral	33,049.09	
Smelting, freight and selling commission	18,811.25	
Insurance	5,277.39	
Taxes	6,932.97	
Office, general expense, transfer registration of stock, etc	12,960.23	
		477,940.87
		195,929.77
Real estate	8,837.65	
Construction and equipment, mine	21,939.57	
Construction and equipment, mill	7,377.37	
Exploring	4,233.21	
		42,387.80
Cash assets, Dec. 31, 1906		$153,541.97

Supt. Wilcox reports:

GENERAL STATISTICS.

Ground broken, 21,286 fathoms of 216 cubic feet each	383,148	tons
Rock hoisted	240,550	tons
Rock stamped	185,789	tons
Mineral obtained at mill	2,350,940	lbs.
Mass copper produced at mine	704,235	lbs.
Total mineral produced	3,055,175	lbs.
Refined copper produced	2,106,739	lbs.
Percentage of mill mineral	.6327	per cent
Percentage of mass copper	.1895	per cent
Total percentage of mineral and mass	.8222	per cent
Percentage of refined copper in mineral and mass	68.96	per cent
Average number of drill machines run	43	

"A" SHAFT.

"A" shaft has reached a depth of 1,746 feet. There is an indication in this shaft that the lode, which has been in the foot-wall, has developed a new angle which will bring it back to the shaft line within a few hundred feet.

"B" SHAFT.

There are no indications of a change in the dip of the Evergreen lode of this shaft; but the change shown in "A" shaft encourages us to expect, at any new level opened, a variation in the lode which will ultimately bring it back near the line of the shaft. The lean ground which has been met on the Evergreen lode in the last few levels may be changed for the better when the lode verges toward the shaft. This shaft is now 1786 feet deep. Changes in the manner of handling the rock in the rock house at this shaft have recently been made, whereby work can be done with about one-half the number of men formerly employed.

"C" SHAFT.

"C" shaft has reached a depth of 841 feet opening up a large chute of fine stamp rock on the Knowlton lode, extending from the surface down with no diminution of the copper contents, promising good ground as further depth is attained. Pockets of good copper ground are also found on the Butler lode, tributary to this shaft.

During the year a rock house has been completed at this shaft, in which we have incorporated some new ideas which facilitates the handling of the rock, decreasing the number of men employed, and cheapening the cost. The rock house has been in commission since June, 1906, and daily shipments are made from that point. The dryhouse has been enlarged, and shaft house enclosed.

"D" SHAFT.

"D" shaft has been sunk 191 feet. When we reached this point it became apparent that the completion of the rock house and installation of a hoist would be delayed, so we changed our plan of sinking. A drift on the third level is being run to "D" shaft, then a raise will be made to connect with the bottom of the shaft, thereby accomplishing our purpose in a cheaper manner, and within a time when the surface equipment is ready.

The ground looks promising, but as no drifting has been done we cannot say as to its extent. The railroad has been extended to this point which will enable us to ship rock during the summer.

STAMP MILL.

The repairs to No. 2 Head will be completed in a short time and further improvements are planned which will reduce the cost of operations at the Mill.

MICHIGAN COPPER MINING COMPANY.

Michigan mine continues to hold the distinction of being the heavies copper producer and the most important mine in the Ontonagon district and from all accounts, is likely to maintain the distinction for some months to come. Important discoveries, however, may be made during the coming summer on the Baltic lode that may result in changing very materially the values of the mines located in Ontonagon County. According to so good an authority as Mr. Alfred Meads, "the Baltic lode can be found, opened at the Belt, Indiana and Firesteel mines at the northeast and at the Evergreen to the southwest and is not a new find by any means."

Michigan Copper Mining Company was incorporated under the mining laws of the State of Michigan, June 15th, with an authoriezd capital of $2,500,000 divided into 100,000 shares of a par value of $25 each. The company owns 4,870 acres of mineral and 1,264 acres of timber lands located in Town 50 and Range 39 near Rockland, Ontonagon County, Michigan.

Officers: President, John Stanton; treasurer, John R. Stanton; Supt., Samuel Brady; assistant superintendent, S. Howard Brady; clerk, Henry Stubansky; mining captain, Adolph Prees; engineer, C. M. Haight.

Owing to a scarcity of labor, the mine was not operated to its full capacity during the first five months of the year 1906, and in consepuence of this unavoidable contingency, the output of rock treated nor the product of copper recovered were not as large as they would have been but for this labor situation. But while the amount of rock stamped during the year was 9,280 tons less than the amount stamped for 1905. In 1906, there was treated 140,720 tons of rock, which yielded 2,875,341 pounds refined copper as against 151,440 tons treated and 2,891,796 pounds of copper recovered in 1905. The yield of refined copper per ton of rock treated was 20.43 pounds in 1906 as compared with 19 pounds for 1905. The showing is a very creditable one and reflects much promise for the future of the property. In fact, a 19 or 20 pound copper proposition today in the Lake Superior district is about as good a thing as some of the best mining people going would ask for. It is much ahead of the lodes mined by Quincy, Mohawk or Osceola and these are pretty good things in their way.

Michigan is developed and operated through three shafts, A, B, and C, sunk in the Calico lode. About 350 men are employed and 36 power drills are operated. "A" shaft is 7 feet by 18 feet within timbers, three-compartment and 1,781 feet deep to below the 14th level. "B" shaft is a thousand feet east of "A" shaft, 7 feet by 20 feet within timbers, three-compartment, and the same depth as shaft "A". "C" shaft is 1,375 feet east of "B" shaft with the same dimensions as shafts "A" and "B", 740 feet deep and sinking. The Calico and Branch lodes are mined. The Calico is an amygdaloid of peculiar appearance usually breaking to a face and displaying on the same face varying colors. It is a strong, well de-

fined belt, but like most other mineral formations of the district, irregular and bunchy. In order to get the best results long stretches must be developed so as to be able to select ground to the best advantage. I have visited the mine and saw some nice rock from the Calico lode just as it was dumped from the shaft house. It looked well and carried good copper values. The Branch vein, however, promises to form the chief source of supply. It is a fissure running diagonally through the Calico and lies on the fifth level, only about 13 feet distant on the footwall side. It averages about four feet wide between well defined walls and promises a great deal for the future of the mine. Some of the openings there disclose exceptionally rich bunches of ground that will yield excellent values in mass and barrel copper and good stamp rock. Lying so closely together the two veins can be worked jointly to great advantage, as the rock from both can be hoisted through the same shaft and manipulated by the same surface equipment. The management is developing this Branch vein in a northernly direction towards the Old Rockland, now forming a part of the Michigan. Continuous and substantial progress has been made. This vein is reached by a series of cross-cuts driven from the openings in the Calico lode at "B" shaft, and about one-third of the product comes out in the form of mass and barrel copper. The eighth, ninth and tenth levels have been driven as much as 1,000 feet from "B" shaft towards "C" shaft, and some fine stretches of ground carrying heavy copper developed. The company has a large block of territory in this direction practically unexplored and indications are that it contains important values.

Underground openings are developed on practical lines and operated on modern methods of mining. Shafts are connected on different levels and ventilation is good. In all, 14 levels are extended from shafts. Sanitary conditions are first-rate and the mine is comfortable for working in. The product is recovered by the over-hand stoping method and it answers first-rate. But little timber is used in the work and that means something. All the rock product was taken out from the third to the twelfth levels. The product is trammed from "mills" to shaft and dumped in skips by hand labor. Daily capacity of the mine is about 460 tons of rock. Skips carry four tons rock to a trip, counter-balancing in shaft and dump directly on grizzles in rockhouse. The whole work is done readily and economically and on up-to-date methods. "C" shaft was sunk 462 feet during 1906; 5,285 feet of drifts were driven in the lodes and 653 feet of cross-cuts were extended. A new 30"x60" Allis Chalmers double drum hoist for "B" shaft was installed and 10 new double dwelling houses were built for employes. There is now under construction a rockhouse, and steel ore bin with gravity haulage trestle between for "C" shaft and a complete stamp-mill at Keweenaw Bay, where the company owns 150 acres of land adjoining the mill site of the Mass Consolidated. The mill will be finished and in commission during the coming season. It will be modern and up-to-date in every particular.

All over the property is in good condition, prospering and is economically operated. Mechanical equipment is mostly modern and in first class mining order. In the natural course of developments, it will likely need strengthening from time to time in order to care for bigger and better results.

VICTORIA COPPER MINING COMPANY.

Capital stock, $2,500,000, in 100,000 shares of $25 each.

Officers: Fred H. Williams, president; Chas. D. Hanchette, vice-president; James P. Graves, secretary-treasurer; George Hooper, superintendent; George Williams, mining captain; C. R. Everett, clerk; Chas. Caddo, mill superintendent; R. S. Schultz, Jr., engineer.

Main offiice, 53 State St., Room 539, Boston, Mass; Mine office, Victoria, Ontonagon County, Michigan.

Victoria mine occupies a very conspicuous place on the top of a hill or plateau and happens to be the westernmost copper producer in the Lake Superior district. The mine location is about three miles from the village of Rockland with the Michigan mine its nearest neighbor. Lands owned consist of 2,300 acres and carry the Minnesota and Forest Conglomerate and several amygdaloids supposed to be the Evergreen. The company develops and works the Evergreen lode, which runs through its territory for 3,000 feet in length on the strike line of the formation. Shafts can be sunk to great depth and lateral openings run the whole length of the company's land in the formation without a break. The mine is operated through one shaft sunk in the lode with about 27,000 feet of ground opened up and in condition for economical extraction. It is planned to sink another shaft as soon as a site can be selected and conditions are right for conducting the work. The main shaft is 8 by 12 feet in dimensions, down to the 22nd level and 2,050 feet deep. It is in good repair and first class running order. The underground workings are opened up systematically and in the best way for practical economical mining. Levels are connected and ventilation is good. Sanitary conditions are good and the mine is safe and comfortable for working in. The breast and back stoping method is used for taking out the product and it works well. Little timber is consumed in the work and this means something to the company for timber costs runs into money fast. The lode is low grade but there is an abundance of it and besides it possess great stability of values. Operating costs are low and the company's product of copper is made exceptionally cheap. This is due largely to the splendid efficiency of the great hydraulic plant in service. In 1906 the company employed about 200 men and operated an air compressor of 5,000 maximum horsepower.

Victoria Mining Company owns one of the most remarkable and unique hydraulic plants in the world. It has been a decided success from

the time water was turned on. It is furnishing the mine and stampmill with all the power used and besides has an excess left of almost two-thirds of its capacity. This excess power can be used for generating electricity that may be sold to neighboring towns and mines for various purposes. The company's stampmill was started up in June, 1906, and during the remainder of the year 39,185 tons of rock were treated. A product of 546,334 pounds of refined copper was recovered or 13.94 pounds per ton of rock treated. The stampmill is equipped with one head and supplementary fittings. Its maximum capacity is 285 tons and about 275 tons of rock are treated daily. The physical condition of the property is sound and every department runs nicely. Copper sells for a high price and the company is making money.

Following is the company's report of operations for 1906.

Directors' report of operations for the year ending Dec. 31, 1906:

On March 9th, water was turned on at the Hydraulic Compressor and in a few moments its success was demonstrated. Since that time the compressor has supplied all the power required for all purposes at the mine and stamp mill with only one of the three intake shafts in commission at less than its full capacity.

The stamp mill was started in June when it was found that only 275 tons of rock per day could be stamped and the resulting small product of mineral made the cost of the copper very much higher than if three or four times that amount had been produced, which would have involved comparatively little additional cost. To increase the stamping capacity a new cylinder for the stamp has been ordered and should be delivered in February, 1907, when it is expected that 400 tons of rock per day will be stamped and 600 or 700 per day when a new shaft is opened, which will be done without delay.

The construction expense has added materially to the cost of the copper, but it is expected that this expense will be comparatively light for some time to come.

Every effort has been made to rush the mining and development work but the management has been retarded very much by the scarcity of labor. For that reason and because of unavoidable difficulties usual to the starting of a new plant, a fair estimate of the cost of producing copper at the Victoria mine cannot be given at this time.

It is the intention of the management to pursue the most vigorous policy of development during the coming year as far as the labor situation will permit.

The tons of rock stamped, the pounds of mineral obtained and pounds of refined copper per ton of rock stamped are as fololws:

Tons of rock stamped 39,185
Pounds of mineral obtained 906,030
Percentage of refined copper in mineral 60,299

Pounds of refined copper per ton of rock stamped 13.94
Product of fine copper (pounds) 546,334

RECEIPTS.

Balance January 1, 1906	$ 73,052.67	
Received for copper	114,870.62	
Profits on sundry accounts, including store	4,417.09	
Interest	224.94	
Rent	3,263.35	$195,828.67

DISBURSEMENTS.

Disbursements for all purposes	$160,999.52	
Balance	34,829.15	$195,828.67

ASSETS.

Cash in bank	$ 4,458.83
Copper	42,771.88
Assessment No. 3	191.00
Supplies	5,465.79
Stock in store	8,066.65
Sundry accounts	256.77
	$61,210.92

LIABILITIES.

Balance due from stockholders	437.12	
Loans	24,000.00	
Accounts payable	1,944.65	$26,381.77
Balance		$34,829.15

Summary of Superintendent Hooper's report:

Upon starting the stamp mill in June we found that the lower exhaust port of the stamp cylinder froze and this necessitated the installation of a preheater. Owing to the small cylinder on our stamp head the daily stamping capacity of the mill has been only about 275 tons. A new 24-inch cylinder to be delivered about February 1, 1907, has been contracted for and will increase the stamping capacity of mill to the limit of concentrating machinery, which will increase our production and materially reduce the cost of production. The hydraulic compressor has given us an abundance of power from one of the three intake shafts. The early part of the winter we had trouble with anchor and frazil ice in the canal which compelled the cessation of operations for ten days. Since the removal of the ice we have had no trouble. We are making preparations to arrange the intake at the dam so as to avoid the flow of frazil and anchor ice coming into the canal.

We need a new shaft on our present vein and expect soon to start work on same, as well as do some exploring on other veins on the property.

Boston, April 20. — The Victoria Copper Company now has on hand in cash and copper sold a balance of about $40,000. According to the annual report issued to January 1st, 1907, the company had on hand at that time $34,829, but had borrowed $24,000. This borrowed money has since been paid. This would show that the company must have earned in the past three months about $29,000 or at the rate of $116,000 per year, or $1.16 per share of stock.

COPPER CROWN MINING COMPANY.

This company is capitalized in $2,500,000 divided in 100,000 shares, par value $25 each. 25,000 shares in the treasury.

Main office, St. Louis, Mo.; Local Office, Matchwood, Michigan.

The mine location is situated near Matchwood in Towns 48 and 49 and consist of 3,700 acres of land. Property embraces six old mines, the Hamilton, Trap Rock, Essex, Windsor, Norwich and Lafayette. In former years, these properties were explored in a small way and some copper values were discovered. The work done on them, however, was in a narrow, crude way and too limited to prove what values they contained in depth, or beyond a small area. The present company employs about twenty-five men and is engaged in exploring the lands in a systematic practical manner by a method of tunneling. A long tunnel is being driven in the side of a hill through which the mineral formation, under investigation, crosses. Bunches of ground carrying copper values have been opened into and the management feels much encouraged over the future outlook for the company.

Baxter L. Brown, general manager; H. B. Kirkpatrick, clerk; J. T. Finnegan, mining captain.

In January, 1907, I mailed a blank to the management of this Company for data for this report. Up to the present it has not reached this office.

SMELTING AND COPPER REFINING PLANTS.

As stated in the report of the Calumet & Hecla mine, found elsewhere in this volume, the copper smelters and refineries of the Company are located at Hubbell, Houghton County, Mich., on the shore of Torch Lake and at Buffalo, New York.

The company's product of mineral is refined, melted into bars and ingots and prepared for the market at these works.

MICHIGAN SMELTING COMPANY.

This company was organiezd in 1903 under the laws of the State of Michigan. Capital, $500,000. Par, $25.

President, Wm. A. Paine; secretary-treasurer, Frederic Stanwood, Main office, Boston, Mass.; Local office, Houghton, Michigan.

Superintendent, Frederick I. Cairns; clerk, W. H. Rowe.

The smelters and refineries of this company are located about three miles west of Houghton, on the shore of Portage lake. At these works the mineral products of the Atlantic, Baltic, Champion, Michigan, Mohawk and Wolverine mines are refined and prepared for the market. About 125 men are employed.

QUINCY SMELTING PLANT.

This plant is also referred to in the report on the Quincy mine found elsewhere in this volume. Besides the mineral product of the Quincy, those of the Franklin, Centennial, Allouez, Mass and Adventure mines are refined and prepared for market at these works. Also a little miscellaneous mineral.

Location, Hancock, Michigan. Will P. Smith, superintendent.

THE LAKE SUPERIOR SMELTING COMPANY.

The plant of this company is located at Dollar Bay, Houghton County, Michigan. Company refines the mineral products of the Osceola Tamarack, Isle Royale and Ahmeek mines.

H. D. Conant, superintendent; assistant superintendent, Joseph Thebo; James McRae, clerk; J. C. Dunstan, clerk.

Postoffice address, Dollar Bay, Michigan.

SALT.

SALT.

The United States consumes 26,872,700 barrels of salt annually, or a barrel for every three persons in the land. Yast year it went abroad for only 1,151,133 barrels. In 1880, 63.5 per cent of the salt used in our country was of home production. Last year 95.7 per cent of the product consumed was produced within the borders of this country. In 1880 the consumption in this country was only 9,384,263 barrels. Thus we see that the people of the United States are using annually three times as much salt as they used 26 years ago.

Only 5,961,060 barrels were produced in this country in 1880, and the consumers were forced to go abroad for 3,427,639 barrels. Last year the total production at home was 25,427,639 barrels. The tariff act of 1894 placed salt on the free list and the importations increased to nearly 560,000,000 pounds the following year. The tariff act of 1897 returned salt to the dutiable list, and sale in bags, barrels or other packages is now subject to a duty of 12 cents a hundred pounds, or 33.6 cents a barrel.

The chief salt producing states are Michigan and New York. Statistics recently gathered by the government show that the combined output of these two states amounts to more than two-thirds of the total production of the United States.

The salt industry of Michigan is in a prosperous condition and practically all the porducing companies of the state had a fairly successful year in 1906. Owing to local conditions, however, conditions which may be overcome if attended to in time, the total number of barrels produced in Michigan during the year under review, showed a decrease of 26,694 barrels as compared with the number of barrels produced in 1905. The total output of the State for the year was 5,644,559 barrels as against 5,671,253 barrels in 1905. Michigan's product of salt for 1906 was about 21 per cent of the total output of the United States.

To Mr. Edwin S. Wildey, ex-Salt Inspector, I wish to acknowledge my obligations for much of the information contained in this report.

SALT PRODUCING DISTRICTS.

The salt producing territory of the State is divided into six districts:

District No. 1, Saginaw County, has ten salt plants, with $400,000 invested, with a capacity of 675,000 barrels per year, and employs 140 men in the manufacture of salt. It has nine steam blocks with forty-two

grainers, and one solar plant with fifty covers. This latter plant is practically out of commission, no salt having been manufactured during the past year. Exhaust steam is used in the manufacture.

NAMES OF PRODUCERS.

E. Germain	9,280
A. G. White	11,497
Bliss & Van Auken	14,300
Mershon, S. P. & Co.	34,467
S. L. Eastman	10,555
Saginaw Valley Traction Co.	902
Saginaw Salt Co.	20,362
Crystal Salt Co.	850
Brand & Harding	11,725
New York Solar Works	76,200
Saginaw Plate Glass Co.	22,356
Total	143,502

District No. 2, Bay County, has four salt companies, with $120,000 invested, with a capacity of 470,000 barrels. Number of wells, 32, with a depth ranging from 950 feet to 1,050 feet. These plants run the year through.

NAMES OF PRODUCERS.

Theo. Hine & Co.	11,891
Kern Mfg. Co.	30,277
North American Chemical Co.	220,182
Mershon, S. P. & Co.	19,964
Total	282,314

District No. 3, St. Clair County, has eight steam plants, with forty-four grainers, six vacuum pans, eighteen wells, employing 500 men when in active operation. Annual capacity, 1,700,000 barrels. Estimated capital, $500,000. This district produces a large amount of dairy salt of excellent quality as well as manufacturing the coarser grades. These blocks are all using live steam and improved machinery. Future of manufacturing is good.

NAMES OF PRODUCERS.

Michigan Salt Works	242,109
Davidson & Wonsey	145,011
Sicken Salt and Stave Co.	45,177
Diamond Crystal Salt Co.	263,356

Thompson Bros.	62,493
Port Huron Salt Co.	597,064
Crystal Flake Salt Co.	10,046
Total	1,365,256

District No. 4, Manistee County, has six steam blocks, with seventy-six grainers, two vacuum pans, employing 475 men. Estimated capital, $550,000; with eighteen wells in active operation, having an average depth of 2,000 feet. Capacity of 3,000,000 barrels per annum. The future of manufacture depends largely upon the lumber district, as salt is now manufactured by exhaust steam and refuse from the saw mills. It is expected that most of these plants will manufacture the coming winter.

NAMES OF PRODUCERS.

R. G. Peters Salt and Lumber Co.	748,861
Louis Sands Salt Co., No. 1	360,562
Louis Sands Salt Co., No. 2	63,857
Buckley & Douglas Lumber Co.	479,622
Filer & Sons	107,464
State Lumber Co.	245,515
Total	2,005,881

District No. 5, Mason County, has three salt companies, with four salt blocks, three vacuum pans and twenty-eight grainers, eight wells ranging in depth from 2,240 feet to 2,284 feet, all in good condition; are employing 180 men in the salt blocks and have a capacity of 1,650,000 barrels per annum. Estimated capital, $300,000. These blocks are using exhaust steam and refuse from the saw mills. Future prospects good.

NAMES OF PRODUCERS.

Stearns Salt & Lumber Co., No. 1	295,305
Stearns Salt & Lumber Co., No. 2	86,530
Butters Salt & Lumber Co.	154,626
Anchor Salt Co.	142,726
Total	679,187

District No. 6, Wayne County, has eight salt companies in active operation, with twenty-two grainers, nineteen vacuum pans and twenty wells, ranging in depth from 1,100 feet to 1,600 feet. Total capacity 2,000,000 barrels per annum. These blocks are using in live steam.

The Detroit Salt Mining and Manufacturing Co. are constructing a mine from which they expect to mine salt in about a year. They are down 360 feet and making 50 feet a month; they expect to mine salt at a depth of 900 feet.

NAMES OF PRODUCERS.

Pennsylvania Salt Co.	435,126
Morton Salt Co.	303,062
Peninsular Salt Co.	33,419
Detroit Salt Co. No. 1	202,750
Detroit Salt Co. No. 2	70,427
Detroit Salt Co. No. 3	16,180
Detroit Salt Co. No. 4	29,123
Hiawatha Salt Co.	42,773
Delray Salt Co.	25,869
Total	1,168,629

RECAPITULATION

District	Total	Per cent
Saginaw County	143,502	2.6
Bay County	282,314	5.0
St. Clair County	1,365,256	24.3
Manistee County	2,005,881	35.6
Mason County	678,977	12.0
Wayne County	1,168,629	20.5
Total	5,644,559	100.0

Comparative table for the past ten years:

1897	3,622,764
1898	4,171,916
1899	4,732,669
1900	4,738,085
1901	5,580,101
1902	4,994,245
1903	4,387,892
1904	5,390,812
1905	5,671,253
1906	5,644,559

The total number of barrels of salt which Michigan has produced to date..... 123,082,535

COAL.

COAL.

The coal producing companies of Michigan had another successful year in 1906. Business of every description was good all over and practically every coal consuming concern was operated to the extent of its capacity. Consumption was enormous and orders for supplies were heavy, often brisk and the result was that local companies had about all they could do to meet the demand. On the average prices realized were satisfactory and net earnings for dividends substantial. A considerable percentage of the amount received from the sale of coal is put back into properties, from time to time, for maintenance purposes. If properties are to be kept in sound physical condition future requirements must be anticipated and provided for in good time. With continuous service everything grows old and wears out and must be renewed or replaced in the regular course of events. Machinery buildings must be added to and mechanical equipment strengthened with new improvements as necessity demands. As a rule Michigan coal mines are in good condition, skillfully managed and economically operated.

From figures received direct from operators I estimate the value of Michigan coal f. o. b. at the mines to be about $2 per ton.

General results as regards the number of men employed, wages paid and number of tons of coal produced will compare favorably with those of previous years. Work was plentiful and men were constantly in demand at good wages. Owing to exhaustion of local conditions a mine or two went out of commission and were abandoned while others again were worked with unusual vigor and decided success.

The coal industry, like that of Portland cement and others, has been fully written up and described in the "Annual Report of the Michigan Bureau of Labor Statistics." The report was prepared by Hon. Andrew Stephenson, inspector of coal mines. Mr. Stephenson's reports are always complete and cover practically every feature necessary to be made known or in which the public can feel any particular interest. I may state again, however, that the information here submitted, with one or two exceptions is official, having come to me direct from the managers in charge of the mines. Blanks and letters were mailed to each manager for the necessary data. When products were omitted, unless the mines were idle, managers in charge failed to fill in and return the blanks to this office.

The total number of tons of coal mined in Michigan in 1906, as reported to me by the managers of the operating companies, was 1,424,927, as against 1,420,347 tons for 1905.

Following are the coal mines operated with products made as reported to this office; also names and post office addresses of managers:

Names of Mines	Products in tons	Names of Managers.	P. O. Addresses
Allen & Walker	1,150	Verne Allen	Grand Ledge
Bay Coal Mining Co	40,000	M. L. Davies	Bay City
Caledonia Mine	87,000	Benjamin R. Cushman	Saginaw
Corunna Coal Co	2,237	Tod Kincaid	Corunna
Eagle Mine	2,376	F. L. Reed	Grand Ledge
Grand Ledge Coal Co	1,061	Fargo Boyle	Grand Ledge
Handy Mine	20,000	Thomas L. Handy	Bay City
Michigan Coal Co	27,717	E. P. Young	Bay City
New Hope	4,700	Geo. W. Jenkins	Jackson
Robert Gage Co	227,527	Chas. Corryell	Bay City
Salzbury Mine	67,043	M. J. O'Malley	Bay City
Vitrified Brick	6,000	John Werner	Bay City
United Coal Co	38,100	John Walsh	Bay City
What Cheer	56,561	E. B. Foss	Bay City
Winona	52,662	E. B. Foss	Bay City
Barnard Coal Co	30,889	R. M. Randall	Saginaw
Central Coal Co	26,494	R. M. Randall	Saginaw
Chappell & Fordney	35,520	R. M. Randall	Saginaw
Riverside	57,877	R. M. Randall	Saginaw
Northern Coal Co	47,805	R. M. Randall	Saginaw
Pere Marquette	54,239	R. M. Randall	Saginaw
Standard Coal	20,200	R. M. Randall	Saginaw
Saginaw	40,662	R. M. Randall	Saginaw
Shiawassee	86,872	R. M. Randall	Saginaw
Uncle Henry	19,391	R. M. Randall	Saginaw
Wolverine No. 2	68,971	R. M. Randall	Saginaw
Wolverine No. 3	128,773	R. M. Randall	Saginaw
Somers No. 1	60,000	James H. Somers	St. Charles
Somers No. 2	70,000	James H. Somers	St. Charles
Somers No. 3	45,000	James H. Somers	St. Charles
	1,424,927		

CONSOLIDATED COAL COMPANY

Miners and Shippers of Bituminous Coal.

Walter S. Eddy, president; Robert M. Randall, general manager; Harry T. Wicks, vice president; George L. Humphrey, secretary-treasurer; Charles W. Stiver, comptroller-purchasing agent.

This company is the largest producing and coal shipping interest in the state of Michigan and operates and controls the following prop-

erties: Saginaw mine, Pere Marquette, Northern Coal & Transportation company, Uncle Henry mine, Wolverine No. 2, Wolverine No. 3, Cass River mine, Riverside mine, Central Coal mine, Standard Coal mine, Shiawassee mine and Barnard Coal company.

It forms a fine business enterprise employing steadily a large force of men at good wages. The people behind the company know the coal business thoroughly and do it right. Properties controlled are worked on up-to-date methods and substantial progress has been made from year to year. Equipments are modern, in good running order and economically operated.

SAGINAW MINE.

Saginaw Coal Company is located in Buena Township, Saginaw County, Michigan. 150 men are employed on an average. One shaft is in operation and this is 160 feet deep. Product for 1906 was 40,662.92 tons. Daily capacity, 300 tons. Property is well managed.

Robert M. Randall, general manager, Saginaw, Mich.

PERE MARQUETTE COAL COMPANY.

Pere Marquette is located at Saginaw, W. S., Michigan. The daily average number of men employed is 170 with active pit in operation which is 200 feet in depth. 54,239.025 tons of coal was produced in 1906 The mine has a fine equipment and is ably managed.

General manager, R. M. Randall, Saginaw, Mich.

NORTHERN COAL AND TRANSPORTATION COMPANY.

The Northern mine is located in James Township, Saginaw County, Michigan. There are 160 men employed on an average with active pit going, which is 190 feet in depth. 47,805.595 tons of coal was produced in 1906. Daily capacity is 300 tons.

General manager, R. M. Randall, Saginaw, Mich.

UNCLE HENRY COAL COMPANY.

Uncle Henry mine is located in Bloomfield Township, Saginaw County, Michigan. Ninety men are employed on an average. One shaft about 150 feet deep is operated and the property shows much improvement. 19,391.79 tons of coal was produced in 1906.

General manager, R. M. Randall, Saginaw, Mich.

WOLVERINE COAL COMPANY.

Wolverine Mine No. 2 is located at Monitor Township, Bay County, Michigan. 180 men are employed on an average. 68,971.04 tons of coal was produced in 1906.

General manager, R. M. Randall, Saginaw, Mich.

WOLVERINE COAL COMPANY.

Wolverine Mine No. 3 is located at Williams Township, Bay County, Michigan. Company employs a daily average of 360 men and operates one shaft, which is 200 feet deep. In 1906 the company produced 128,773.925 tons of coal.

R. M. Randall, Saginaw, Mich., General Manager.

RIVERSIDE COAL COMPANY.

Riverside coal mine is located in James Township, Saginaw County, Michigan. Company employs 205 men on an average and operated one coal pit which is 170 feet in depth. The number of tons of coal produced in 1906 was 57,877.4.

R. M. Randall, Saginaw, Mich., General Manager.

CENTRAL COAL MINING COMPANY.

Central coal mine is located at Bay City, Michigan. 110 men are employed on an average and 26,494.4 tons of coal were produced during 1906.

R. M. Randall, Saginaw, Mich., General Manager.

CHAPPEL & FORDNEY COAL COMPANY.

Chappel & Fordney coal mine is located at Saginaw, Michigan, W. S. Daily average number of men employed is 120 and one coal pit is operated at a depth of 230 feet. 35,520.98 tons of coal was produced in 1906.

R. M. Randall, Saginaw, Mich., General Manager.

STANDARD COAL MINING COMPANY.

Standard coal mine is located at Bridgeport Township, Saginaw County, Michigan. Average number of men employed daily is 140. One shaft is operated which is at a depth of about 200 feet.

Product of coal for 1906 was 20,200 tons.

SHIAWASSEE COAL COMPANY.

Shiawassee coal mine is located in James Township, Saginaw County, Mich. 210 men are employed on an average daily. One shaft is operated and is in fine condition. 86,872.745 tons of coal were produced during 1906.

R. M. Randall, General Manager, Saginaw, Mich.

BARNARD COAL COMPANY.

Barnard coal mine is located at Saginaw, Mich., W. S. The average number of men employed daily is 210 and one active coal pit is operated, which is 190 feet in depth. 30,989.625 tons of coal were produced in 1906.

R. M. Randall, General Manager, Saginaw, Mich.

ALLEN & WALKER COAL COMPANY.

Allen & Walker mine is located at Grand Ledge, Eaton county. Verne Allen is president and general manager. Property consists of 20 acres. The mine is opened and operated through one drift-shaft about 330 feet deep in a coal seam from 18 to 28 inches thick. About 1,000 tons of coal are opened and held in reserve for future products. Product is broken by hand labor and hauled out of the workings by horse power. Seven men are employed on an average. The output in 1906 was between 1,100 and 1,200 tons of coal, which was sold at the mine.

Verne Allen, general manager, Grand Ledge, Mich.

SALZBURY COAL MINING COMPANY.

Salzbury coal mine is located at Bay City, Michigan. Leonard Eichorn, president; M. J. O'Malley, secretary-treasurer and general manager.

In 1906 this company employed about 60 men daily and produced during the year 67,043 tons of coal. The property, however, is nearly worked out, as by August, 1907, the management expects to have it entirely exhausted. Men are at work pulling the pillars and the daily output runs only about 100 tons as against 250 tons formerly. Since first opened the property has produced 171,043 tons of coal.

General manager, M. J. O'Malley, Bay City, Mich.

MICHIGAN VITRIFIED BRICK COMPANY.

W. J. McCauley, president, Mancelona, Mich.; E. L. Mather, secretary-treasurer and general manager, Bay City, Mich.

This company classes itself with the brick manufacturers rather than among the coal producers, and mines only about enough coal to meet

its own requirements. The working plant is located at Frankenlust, Bay County, Michigan. Seventy-five men are employed and in 1906 the company produced 6,000 tons of coal. Product is recovered through one shaft, 124 feet deep and 8 by 16 feet in dimensions. Real estate holdings consist of 981 acres containing a coal seam about three feet thick. Compressed air and hand labor are used for taking out the product. The property is well managed and in a prosperous condition. There is a ready market for all the brick the company can turn out and the management has now planned to build additional brick kilns.

John Werner is mine superintendent. Postoffice address, Bay City, Michigan.

THE J. A. SOMERS COMPANY.

J. H. Somers, president and C. W. Somers, vice president, St. Charles, Mich; John A. Foerstner, secretary-treasurer, Cleveland, Ohio.

This company owns and operates three substantial coal mines and two salt producing enterprises.

The mines are: Somers No. 1, Somers No. 2 and Somers No. 3, all of St. Charles, Mich., and working the St. Charles coal bed. Combined annual capacity of the three mines approximately 200,000 tons of coal. Company had a prosperous year in 1906, the only draw-back being scarcity of laborers.

Somers Mine No. 1 employs on an average about 200 men. One shaft is operated, which is 200 feet deep and 8x14 feet in dimensions. Area of coal lands consist of 2,800 acres and coal seams run from three to five feet deep. Equipment includes six H. T. boilers, two dynamos and engines. 60,000 tons of coal was produced in 1906. There was a total number of 900,000 tons of coal produced previous to 1906. The product is taken out by both electric appliances and hand labor. Shaking screens and railroad scales were added to the equipment in 1906. Improvements underway consist of new mine cars, locomotive, electric pump, new fan, etc. Approximate cost of improvements for 1906 was $10,000.

This property has such a large acreage, that possibly two more shafts will have to be sunk on the same in order to work out the coal. Operating this mine for eight years, only 200 acres of this vast field has been exhausted, and the life of the same can be readily seen, at the above acreage. The coal from the above is of the high St. Charles standard.

The physical condition of this property is excellent and the future outlook is considered very good.

Somers Mine No. 2, like No. 1, is a fine mine and a successful business enterprise. It is operated on up-to-date methods and progress has been onward, towards bigger and better things. Real estate holdings consist of 342 acres with the underlying coal seam about four feet thick. Openings in the coal body run 1,000 feet north, 2,500 feet west and 1,500

feet south. The product of coal is recovered through one working shaft 8x14 feet in dimensions, substantially timbered and 200 feet deep. There are 225 names on the pay roll and $15,000 were spent for improvements in 1906. Mechanical equipment embraces, besides supplementary fittings and additions, hoisting engines, locomotives and 12 electric cutting machines. Machinery is operated by both steam and electricity. The product of coal for 1906 was 70,000 tons. Since the beginning of operations, the company has produced upwards of 1,000,000 tons.

The Saginaw Salt Company's factory, with a daily capacity of from 400 to 500 barrels of salt, is also operated by the working plant of this property.

Speaking in general of the Michigan coal, the St. Charles bed, of which this company controls over 3,000 acres, would say, it is conceded by the steam trade in general and by chemical analysis, to be the best coal in the State of Michigan. This coal ranks along the same line as the famous Massillon Ohio coal for a domestic proposition. The worst feature of the mining end of it is the scarcity of laborers. The physical condition of this property appears excellent.

Somers No. 3 is also a profitable mine and a successful enterprise. Operations are conducted the best way for bringing the best results and everything in and about the mine is running smoothly and doing fine service. Real estate owned consists of 442 acres with coal seams running about 3½ feet thick. About 75 acres have been mined out from which it may be seen that the property may continue to be a substantial producer for many years to come. The product is taken out through one large shaft 200 feet deep and 8x14 feet in dimensions. Length of coal body reaches 2,000 feet north, 2,000 feet west and 1,000 feet east.

Mechanical equipment includes hoisting engine, three boilers, 100 pit cars, besides supplementary fittings and additions. In 1906 about $10,000 was spent for betterments and it is planned to put in new shaking screens and provide additional new rolling stock. Last year the company enployed on an average 150 men and produced 45,000 tons of coal. The report on Mine No. 2, as to quality of coal, applies to this seam also. No salt block or factory at this plant.

BAY COAL MINING COMPANY.

The Bay Coal Mining Company's property forms a substantial mine and a successful business enterprise. Realty holdings consist of 640 acres centrally located within the coal zone. The mine is developed and operated through one shaft 147 feet deep extending into a coal seam approximately 3½ feet thick with openings as much as 1,700 feet in extent.

The company employs an average daily force of 100 men. Output of coal in 1906 was 40,000 tons. Since the beginning of operations, the mine has produced something like 340,000 tons of good coal and it is good

for years to come. Product is mined by air punching machines and hand labor. The management is progressive and up-to-date and the property is economically operated. Equipment is adequate for present requirement.

General manager, L. M. Davies, Bay City, Mich.

HANDY BROS. MINING COMPANY.

This company controls and operates the Handy mine located about five miles from Bay City between the Michigan Central Railroad and the Midland Rock Road with 600 acres of land. Although practically a new mine, it has been developed into a substantial producer and a fine business enterprise. Operations are conducted on up-to-date methods and progress has been continuous. Property is fully equipped with first motion hoist, automatic dumping cages and fittings of the latest design. The mine is developed and operated through one fine shaft 8x16 feet in dimensions, substantially timbered and 145 feet deep. Underground openings reach as much as 80 feet in length and the coal seam averages five feet thick. In 1906 the company spent approximately $75,000 for betterments and permanent improvements, and are now contemplating sinking two additional shafts. An average daily force of 175 men are employed and in 1906 the coal output was 20,000 tons.

Thomas L. Handy, president and manager; Frank S. Handy, secretary; George W. Handy, treasurer, all of Bay City, Michigan.

THE MICHIGAN COAL AND MINING COMPANY.

This company operates the Michigan mine, which has been a steady producer for the past ten years and appears to be good for years to come. Mine is opened and developed through one substantial shaft 6x14 feet in dimensions and 136 feet deep. Area of land consists of 450 acres and coal seam runs from three to 3½ feet thick. Underground openings aggregate 5,000 feet in extent. Management has just started to produce from a fresh pocket of coal that promises well for the future of the property. Equipment is in good condition and running successfully. Improvements have been added when needed that resulted in maintaining the property in sound physical condition and keeping down operating costs. In 1906 the company employed an average force of 64 men and produced 27,717 short tons of coal.

J. Wentworth, president; E. P. Young, secretary-treasurer and general manager. Postoffice address, Bay City, Mich.

FRANK L. REED COMPANY.

The Frank L. Reed Company operates a mine located at Grand Ledge, and employed on an average six men daily during 1906. Product

is recovered through one drift-shaft 5x10 feet in dimensions and 36 feet deep. Lands owned consist of 40 acres. Length of underground openings approximate 650 feet with the coal seam running from 28 to 32 inches thick. Property is opened up fairly well ahead and in good working condition. Pick work is used for breaking the product. In 1906 about $1,000 were spent for betterments and the position of the property strengthened. The company depends on local consumption for support and none of its product, thus far, has been shipped away. Equipment embraces steam hoist haulage with supplementary fittings adequate for immediate requirements. Product of coal in 1906 was 2,376 tons.

Frank L. Reed, manager, R. F. D. No. 3, Grand Ledge, Mich.

THE EUREKA COAL MINING COMPANY.

The Eureka coal mine—a little better known, perhaps, as the Owosso Coal Company—had not up to the end of the year under review succeeded in entering the ranks of the permanent producers of coal. The company, however, is developing its property on modern methods and good progress has been made, and of the kind that will bring the best kind of results when production once begins for good. Underground developments are conducted through one permanent shaft, 7x15 feet in dimensions and 92 feet deep. Capacity of the plant when completed will be 200 tons daily. In 1906 the company employed a daily average force of 36 men and spent $18,000 on improvements. Real estate owned, 320 acres. Width of coal seam, 40 inches thick.

Harry Gay, president; Carl Pickart, manager, Corunna, Michigan.

CORUNNA COAL COMPANY.

Tod Kincaid, president; F. C. Gale, secretary-treasurer.

This company's property is mined through one coal pit, 16 feet deep and 548 feet in dimensions. The coal seam is about 3 feet thick with underground openings running about 600 feet in extent. Reserves of coal are pretty well worked out and the product made in 1906 was taken from a small pocket of coal opened up at the request of a few of the old miners who had their homes there and did not care to move away during the winter season. In 1906 the company employed a daily average of 10 men and produced 2,237 tons of coal. Mine equipment is not extensive being valued at about $1,000.

CALEDONIA COAL COMPANY, LTD.

This company is practically a new proposition with a promising future and is located at Saginaw East side, with 40 acres of land and a progressive management. Mine is operated through one shaft 68 feet square in dimensions and 157 feet deep. Openings in the coal body approx-

imate 300 yards with the seam of coal running about 34 inches thick. Roof consists of a good slate material and stands up first-rate. Product is taken out by the Room and Pillar method. Daily average number of men employed is 65, and the mine is opened up on modern methods and ably managed. Progress has been substantial, and everything in and about the property runs nicely. Improvements have been introduced from time to time that strengthen the position of the mine and keep down costs. Daily capacity of plant is 350 tons. Output of coal in 1906 was 87,000 tons. The management reports the outlook for coal in Michigan good.

General manager, James McCulloch, Saginaw, Mich.

ROBERT GAGE COAL COMPANY.

This company is located at St. Charles, Mich. The daily average number of men employed is 600. Two shafts are operated and they are 180 and 160 feet in depth, 14x7 feet in dimensions, and area of lands owned 2,382 acres. Coal seam is from 3 to 5 feet in depth. Equipment embraces first motion engines, self-dumping cages, shaker screens and mule haulage, all in good running order. 227,527 tons of coal was produced in 1906 and the total number of tons produced previous to 1906 was 511,090. Product is taken out by hand power. No new improvements were made during 1906.

Robert Gage, president; F. T. Woodworth, secretary; F. W. Urch, treasurer; Charles Corryell, general manager, Bay City, Mich.

UNITED CITY COAL MANUFACTURING CO.

W. H. Chapman, Bay City, president; John Walsh, general manager.

The daily average number of men employed by this company is 100. One shaft is operated, which is 130 feet deep and 8x16 feet in dimensions. Area of coal lands operated consist of 60 acres. Product is taken out by hand labor and 38,000 tons of coal were produced in 1906.

WINONA COAL AND MINING COMPANY.

Winona coal mine is located at Bangor Township, Bay County, Michigan. 250 men are employed daily on an average. One active shaft is in operation, which is 135 feet deep, and 8x16 feet in dimensions. Area of coal lands consists of 416 acres. Depth of the coal seam is four feet by six inches and the length of the openings in the coal body is 3,500 feet. One hundred acres of coal is opened up and available for production. Approximate cost of new additions made in 1906 was $9,000. Product is taken out by hand, air and electricity. Number of tons of coal produced in 1906 was 52,662, and the number of tons produced previous to 1906 approximate 600,000 tons. The physical condition of this property appears good.

E. B. Foss, general manager.

GRAND LEDGE COAL COMPANY.

Grand Ledge coal mine is located at Grand Ledge, Mich. Seven men are employed on an average and one drift pit is operated in a coal seam 18 inches thick. 1,061 tons of coal was produced in 1906.

General manager, Fargo Boyle, Grand Ledge, Mich.

NEW HOPE MINING COMPANY.

New Hope mine is located two miles northwest of Jackson, Mich. During the time this company was in operation during 1906, it produced 4,064.16 tons of coal.

General manager, George W. Jenkins, Jackson, Mich.

WHAT CHEER COAL MINING COMPANY.

What Cheer mine is located in Merritt Township, Bay County, Mich. Company employs on an average 125 men and produced during 1906, 56,561 tons of coal. Total number of tons of coal produced previous to 1906 was 37,954. This property is operated through one shaft, 206 feet deep and 8'4"x16'6" in dimensions. Area of coal lands is 540 acres with depth of coal seams about 30 inches. Length of openings in coal body, 2,000 feet. Approximate amount of coal opened up and available for production, 80 acres. The product is taken out by electric and hand power appliances. A new slack conveyor is underway or contemplated. Approximate cost of improvements made in 1906, $10,000. The physical condition of the property is good.

E. B. Foss, Bay City, Michigan.

WRIGHT MINE NO. 1.

The Wright mine is located at Grand Ledge, Mich.

Four men are employed on an average and one drift is in operation which is 40 feet in depth. Area of lands consist of 20 acres. Coal seam is 20 inches. Length of openings in coal seam, 350 feet. Approximate amount of coal opened up and available for production, 2,000 tons. Product is hoisted by horse power and drum, and taken out by hand labor. About 2,000 tons of coal was produced in 1906. The physical condition of the property is said to be good. Coal is all sold to local trade, most of it at the mine.

General manager, Eben Wright, Grand Ledge, Mich.

STARK COAL MINING COMPANY.

The Stark mine is located at Eagle Township, Clinton County, Mich. The coal is nearly exhausted, therefore, this mine has been abandoned.

T. M. Jenkins, general manager.

CEMENT.

CEMENT.

PORTLAND CEMENT PLANTS IN OPERATION IN MICHIGAN.

Name of Organization.	Location of Plant.	Name of Manager.	Address of Manager.
Aetna Portland Cement Co.	Fenton.	R. D. Evans	Detroit
Alpena Portland Cement Co.	Alpena.	Chas. H. Reynolds	Alpena
Bronson - Kalamazoo Portland land Cement Co.	Bronson.	J. F. Townsend.	Akron, Ohio
Burt Portland Cement Co.	Bellevue.	W. R. Burt.	Saginaw
Elk Rapids Port. Cem't Co.	Elk Rapids.	E. M. Sly	Petosky
Egyptian Portland Cem't Co.	Fenton.	Chas. L. Bussey	Fenton
Farwell Portland Cem't Co.	Farwell.	J. S. Littlefield	Farwell
Great Northern Portland Cement Company	Marlborough.	F. E. Farnsworth	Detroit
Newago Portland Cem't Co.	Newago.	W. J. Bell	Newago
Omego Portland Cem't Co.	Mosherville.	Chas F. Wade	Jonesville
Peninsular Portland Cement Company	Cement City.	W. F. Cowham	Cement City
Peerless Portland Cement Co.	Union City.	J. A. Patterson	Union City
Toledo Portland Cement Co.	Manchester.	W. L. Watkins	Ann Arbor
White Portland Cement Co.	Chelsea.	H. W. White	Chelsea
Wolverine No. 2 Portland Cement Company, No. 1 Mill.	Coldwater.	L. M. Wing	Coldwater
No. 2 Mill	Quincy.	L. M. Wing	Coldwater
Wyandotte Portland Cement Co.	Wyandotte.	H. J. Paxton	Wyandotte
The Hecla Company	Bay City.	John F. Bush	Detroit
The Chanute Cement Co.	Bronson.	C. H. Powley	Bronson

PORTLAND CEMENT STATISTICS.

Name.	Average No. men employed in 1905.	No. bbls. Cement produced in 1905.
Aetna	102	300,000
Alpena	150	380,000

	Average No. men employed in 1905.	No. bbls. Cement produced in 1905.
Bronson	75	150,000
Burt	130	230,000
Elk	90	150,000
Egyptian	100	140,000
Farwell Portland		
Great Northern	125	127,975
Newago	150	310,000
Omego	65	160,000
Peninsular	140	400,000
Peerless	115	430,000
Toledo		
White		
Wolverine	339	700,000
Wyandotte	90	143,130
The Hecla Company		150,000
Chanute		152,000
	1,671	3,923,105

The Portland Cement Industry in Michigan is in a flourishing condition with every company in shape for doing business, running to the extent of its capacity and making money. There is business enough in sight to keep plants busy for months ahead and the outlook for at least all of 1907 is considered first-class and about all that could be desired. For this excellent economic mineral, a phenomenal demand has sprung up in recent years and results accomplished in 1906, as regards the number of barrels of cement manufactured and the amount of money earned surpassed all previous records. New uses for the product are constantly coming up and its consumption is increasing at an astonishing rate. There seems to be no let up to the demand for supplies and more men are now employed, at good wages, in getting out the product than ever before. And in most instances wages have been advanced unsolicited which is a very satisfactory condition of affairs.

For general purposes, the Portland Cement manufactured in Michigan is considered among the best brands made and while orders for consignments come from nearly all over, the bulk of Michigan's product is consumed within the state. As a rule, operating plants are in fine physical condition and up-to-date in most particulars. Mechanical equipments and appliances are among the most modern and best known for bringing the most satisfactory results and they are about as automatic in operation as it seems practicable to make them. Progress has been substantial and of the kind that counts for stockholders and for everybody else in any way interested with the industry. Generally speaking, plants are running to

perfection and companies are doing well. The people connected with the business know it thoroughly and do it right. There is no guess work. The business is reduced to a mathematical problem and conducted with exacting knowledge and definite results.

Annual costs for necessary improvements and betterments run into considerable sums of money, but expenditures are well placed and the result is that plants are maintained in a high state of efficiency and in good running order.

A very complete and full report on the Cement Industry of Michigan may be found in the Annual Report of the Michigan Bureau of Labor and Industrial Statistics. The report is made under the direction of Hon. Scott Griswold, Commissioner of Labor, Lansing, Michigan. In view of this provision, a lengthy report from me seems unnecessary or unexpected. While my remarks on the industry may be brief it may not be amiss to state that the information submitted is official in practically every particular, for it came to this office direct from the managers in charge of the works.

THE AETNA PORTLAND CEMENT CO.

The Aetna Portland Cement Company is manufacturing cement at Fenton, Mich., and has a very complete, up-to-date equipment, embracing eight rotaries, 60x6 feet with supplementary appliances and additions. Daily capacity, 1,000 barrels finished cement. Approximate cost of plant, $550,000. Area of land owned, 700 acres. Improvements underway includes a new 300 horse-power boiler and additional grinding machinery. On an average 102 men are employed and in 1906 the company paid out in the neighborhood of $100,000 for wages. The number of barrels of cement manufactured during the year was 300,000. Property is in fine condition and ably managed.

E. M. Bruce, Fenton, Mich., superintendent; J. A. Myers, Detroit, Mich., manager and treasurer; R. D. Evans, Detroit, Mich., president.

THE ALPENA PORTLAND CEMENT COMPANY.

The Alpena Portland Cement Company is manufacturing cement at Alpena, Mich. Company has a very complete plant efficiently operated and employs on the average about 150 men. Daily capacity is 1,200 barrels of cement and the approximate cost of the plant was $600,000. Equipment includes six kilns with supplementary fitting. 2,000 acres of land is owned by the company. The number of barrels of cement manufactured in 1906 was 380,000. About $111,000 was paid out for wages last year. The outlook for 1907 is considered very good.

Herman Besser, president; George E. Holmes, vice president; Chas. H. Reynolds, secretary; W. H. Johnson, treasurer, all of Alpena, Mich.

BRONSON-KALAMAZOO PORTLAND CEMENT COMPANY.

Bronson-Kalamazoo Portland Cement Company, located at Bronson, Michigan, had a good year in 1906. The number of barrels of cement manufactured was 150,000 as against 93,000 barrels reported for the previous year. The company has made substantial progress and the plant is quite complete, in good running order and managed with much skill and capability. The plant has a daily capacity of about 1,000 barrels finished cement for which there is a ready market at good prices. The approximate cost of the plant is $750,000. It embraces ten modern rotaries with supplementary appliances and the necessary buildings, etc. In 1906 the company employed an average of 75 men daily.

J. F. Townsend, Akron, Ohio, president and general manager; W. E. Wheeler, Akron, Ohio, secretary-treasurer. Postoffice address, Bronson, Michigan.

THE BURT PORTLAND CEMENT COMPANY.

The Burt Portland Cement Company is a growing concern with a very promising future. The working plant is located at Bellevue, Mich., with eight modern rotaries in operation. It is skillfully managed and in good running order. There are about 130 names on the payroll and in 1906 the company manufactured 230,000 barrels of cement.

W. R. Burt, manager. Postoffice address, Saginaw, Mich.

ELK RAPIDS PORTLAND CEMENT AND LIME COMPANY.

Elk Rapids Portland Cement & Lime Company is operated and controlled by progressive, practical people, who anticipate future requirements and prepare for them in good time. A general enlargement of the plant has been going on during 1906. The management is arranging to double the capacity, or practically so of the works. Two new modern rotaries with additional grinding machinery and the usual fittings are being added to the works. Good progress is being made. With the completion of the betterments, the capacity of the plant will be increased to 1,000 barrels daily.

The working plant is located at Elk Rapids where the land holdings of the company comprise some 700 acres. In 1906 the company employed a daily average of 90 men, paid out for wages about $40,000 and manufactured about 150,000 barrels of cement. The approximate cost of the plant is $250,000.

Momer Sly, Elk Rapids, Mich., manager; E. M. Sly, Petosky, Mich., C. A. Whyland, Chicago, Ill., president.

THE EGYPTIAN PORTLAND CEMENT COMPANY.

The reorganization of the Egyptian Portland Cement Company has been completed and the company is now in successful operation. For

1907 the outlook is reported by the management to be very bright and that orders could be taken at once for more cement than the company can produce during the whole year. The company's works are located at Fenton, Mich., with realty holdings consisting of 906 acres. In 1906 the company employed a daily average of 100 men, paid out for wages about $50,000 besides $25,000 for betterments and manufactured 140,000 barrels of cement. The plant is in fine physical condition and running practically to perfection. It embraces nine modern rotaries, grinding machinery and fittings of the best type, eight of which are in commission and doing good service.

Chas. L. Bussey, Fenton, Mich., manager; E. D. Kennedy, secretary-treasurer; C. Tucker, president.

THE FARWELL PORTLAND CEMENT COMPANY.

The Farwell Portland Cement company's plant is located at Farwell, Mich. Plant is not as yet completed and no output was made in 1906. When completed it will have a daily capacity of from 800 to 1,000 barrels finished cement.

J. S. Littlefield, Farwell, Mich., president and manager.

GREAT NORTHERN PORTLAND CEMENT COMPANY.

Great Northern Portland Cement Company is located at Marlborough, Mich., C. A. Strelinger, Detroit, Mich., president; David Ogilire, Detroit, treasurer; Fred E. Farnsworth, Detroit, general manager and secretary.

This plant is now in the hands of a receiver—The Michigan Trust Company, Grand Rapids, Michigan. W. S. Pritchard, Manager for Receiver.

The company owns 8,000 acres of land and the approximate cost of the plant is $1,000,000. Daily capacity is 1,500 barrels. Average number of men employed was 125, and the company manufactured 127,975 barrels of cement in 1906. Machinery is now being installed to bring the daily capacity up to 3,000 barrels. There are nine rotaries installed and six in operation. Improvements added to the plant during 1906 is $50,000. Improvements are underway for completing change, from Marl to Rock. Approximate amount paid in wages during 1906 was $100,000.

Company reports outlook for 1907 good.

THE NEWAGO PORTLAND CEMENT COMPANY.

The Newago Portland Cement Company is located at Newago, Mich. Lands owned consist of 100 acres. Company has an up-to-date equipment embracing eleven modern rotaries, eight of which are operated Approximate cost of the plant, $1,000,000. Something like 150 men are

employed daily and last year the company paid out about $110,000 for wages besides $25,000 for betterments. The property is in good physical condition and economically operated. Its daily capacity is 1,500 barrels.

In 1906 the company manufactured 310,000 barrels of cement. The management reports the outlook for 1907 as "good."

W. J. Bell, manager, postoffice address, Newago, Mich.; D. McCool, Grand Rapids, Mich., president and treasurer; Clay H. Hollister, Grand Rapids, Mich., secretary; J. F. Lockley, Grand Rapids, Mich., sales agent.

THE OMEGA PORTLAND CEMENT COMPANY.

The working plant of the Omego Portland Cement Company is located at Mosherville, Mich. Company has an up-to-date plant and employs a force of 65 men. Daily capacity of plant, 700 barrels of cement. Equipment embraces five modern rotaries with supplementary fittings and necessary buildings.

Last year the company paid out for wages $50,000 besides $18,000 for improvements and betterments. There is now something like $15,000 worth of new work underway. The number of barrels of cement manufactured during 1906 was 160,000.

The works are kept in first class condition and well managed.

Chas. F. Wade, Jonesville, Mich., secretary-treasurer and manager; F. M. Stewart, Hillsdale, Mich., president.

THE PENINSULAR PORTLAND CEMENT COMPANY.

The Peninsular Portland Cement Company is located at Cement City, Mich. Approximate daily capacity is 1,500 barrels and the daily average number of men about 140, are employed. 400,000 barrels of cement was manufactured during 1906. Nine rotaries are installed and in operation. About $85,000 in wages was paid out during 1906 and the outlook for 1907 is excellent.

W. F. Cowham, president and manager; J. W. Shove, secretary; W. S. Potter treasurer.

THE PEERLESS PORTLAND CEMENT COMPANY.

The Peerless Portland Cement Company, located at Union City, is one of the oldest and best known cement manufacturing companies in Michigan. Approximate cost of the plant $1,400,000. In the past year or two this company has spent considerable sums of money for permanent improvements. The mechanical equipment has been overhauled and modernized in practically every particular. It is now about automatic in operation and in shape for bringing the best results. 115 men are employed on an average, and in 1906 the wages paid amounted to nearly $100,000. Equipment includes nine 70 feet rotaries with additional grinding ma-

chinery underway or contemplated. The plant is in good physical condition and runs smoothly. Is well and economically managed. Output for 1906 was 430,000 barrels cement.

J. A. Patterson, Union City, Mich., manager; A. W. Wright,, Alma, Mich., president; Wm. M. Hatch, Union City, secretary-treasurer.

THE TOLEDO PORTLAND CEMENT COMPANY.

The Toledo Portland Cement company's works are located at Manchester, Mich. The plant is designed for a daily capacity of 1,000 barrels of cement. It was never completed and is still in receivership with Mr. W. L. Watkins of Ann Arbor, Michigan, receiver.

THE WHITE PORTLAND CEMENT COMPANY.

The White Portland Cement company went into the hands of a receiver on October 20, 1905, since which time the entire plant has been idle; only such men being employed as are required for watchmen.

WOLVERINE NO. 2 PORTLAND CEMENT COMPANY.

Wolverine No. 2 Portland Cement company's works are located at Mill No. 1, Coldwater, and Mill No. 2, Quincy, Mich. Land owned by the both plants consists of about 2,200 acres. Approximate cost of the plants, $1,000,000 with a daily capacity of 3,500 barrels of cement. Average number of men employed daily at these plants is about 339 and the number of barrels of cement manufactured during 1906 was 700,000. This is one of the successful companies doing business in the state. 28 rotaries are installed and 20 are in operation. Both plants are running with distinct success. The approximate amount paid in wages during 1906 was $217,555 at both plants. Outlook for 1907 is reported "good."

L. M. Wing, president and manager, Coldwater, Mich.; E. R. Root, secretary-treasurer, Coldwater, Mich.

WYANDOTTE PORTLAND CEMENT COMPANY.

Wyandotte Portland Cement company is located at Wyandotte, Mich. Approximate cost of plant is $200,000. Daily capacity 800 barrels. Average number of men employed daily is 90 and 143,130 barrels of cement was manufactured during 1906. Three rotaries are installed and in operation. In 1906, the capacity of the plant was increased from 300 to 800 barrels. $49,330 was paid out in wages for 1906. Outlook for 1907 is considered very good.

H. J. Paxton, general manager, Wyandotte, Mich.

MISCELLANEOUS MINERALS.

MISCELLANEOUS MINERALS.

BUILDING STONE.

PORTAGE ENTRY QUARRIES COMPANY

Red Stone Quarry office, Calumet, Michigan. General office, 502 Chamber of Commerce, Chicago, Ill. J. W. Wyckoff, manager.

This company operates the Traverse Bay quarry, Portage Entry quarry and Marquette quarry, besides the Port Wing, Wis., quarry.

REPORT FOR 1906

Quarried		
Jacobsville, Mich.	89878-2	
Marquette, Mich.	17717-5	
Port Wing, Wis.	40694-4	
Port Wing, Wis.	40694-4	148289-11
Shipped from quarries		
Jacobsville, Mich.	77878-2	
Marquette, Mich.	15848-1	
Port Wing, Wis.,	40711-3	134437-6
Average number of men employed at quarries daily		
Jacobsville, Mich.	Leased	
Marquette, Mich.	50	
Port Wing, Wis.	30	
Approximate amount of wages paid out in carrying on the work		
Jacobsville, Mich.	10311.50	
Port Wing, Wis.	7982.99	

The outlook for the stone industry in 1907 is very good.

GRAPHITE

Graphite is produced at L'Anse, Michigan, by Hathaway Graphite Manufacturing company and the Detroit Graphite Paint company. Besides these two, the United States Graphite company operates at Saginaw, Mich. but receives its supply of crude graphite from Mexico.

HATHAWAY GRAPHITE MANUFACTURING COMPANY

This company has a graphite property near L'Anse, Baraga county, and controls 160 acres of graphite land, with plant for grinding the ore located at the mine. Three men can handle the plant, when running full capacity, the ore being handled by machinery which is run by water power. It has also an engine for use if necessary. Capacity of the plant about five hundred tons a year, made into three grades which market at from $25 to $60 per ton. This graphite is the most suitable for paint purposes and foundry facings. Main office, Detroit, Mich. Manager, P. McDuff.

THE DETROIT GRAPHITE PAINT COMPANY

In 1906 the Detroit Graphite Paint company mined and shipped to Detroit about 500 tons of crude graphite which was all used in the manufacture of graphite paints. It is used only as a paint pigment.

Main office, Detroit, Michigan; local office, L'Anse, Michigan; A. A. Boutell, president; R. C. Williams, Agent.

UNITED STATES GRAPHITE COMPANY

At this property, 4,000 tons of graphite was used up which was all from Mexico and 115 men were employed during 1906.

GYPSUM

Gypsum is found in remarkable abundance and purity at Grand Rapids and Alabaster, and in moderate quantities at various other places. This mineral is very properly classed among the useful products of the state and its production and manufacture form an important, growing industry. While the growth of the industry has been somewhat slow, yet it has been steady, wholesome and continuous. There is more capital invested in the business now than ever before, and producing companies, generally are in a prosperous condition. The market for finished products is constantly broadening and more men are employed in the gypsum industry at the present time than in any former period in its history. The stratum of gypsum at Grand Rapids is about eighteen or twenty feet in thickness and from a foot or two to sixteen feet below the surface, and fully a thousand acres in extent, affording practically an inexhaustible supply to draw upon. The development of the gypsum industry in this state, while in a healthy condition, is practically confined to the city of Grand Rapids where the product is quarried in considerable quantities, ground and prepared as a basis for wall tintings, wall decorations, stucco work, plasters, fertilizers and for other uses. For wall tinting and decorating, alabastine and allied gypsum products are among the best things made for such purposes. On account of the excellent sanitary properties of the articles

and the ease with which the different preparations may be applied, they are becoming popular all over the United States and in many parts of Europe. Calcium gypsum is known as plaster of Paris. The finer grades are carefully reground and sold for dental plates, for casts and moulds and also for works of art and architecture. The demand for these products is constantly increasing and the outlook for the gypsum industry is reported very promising.

Regarding gold, silver, slate, asbestos and marble, there is nothing to be said other than what appeared in my previous report.

INDEX.

Abeel, Geo. H..... 81
Adventure mine.....198
Agassiz, Alexander.....119
Ahmeek mine.....180
Allen & Walker mine.....220
Allen, Verne.....220
Allouez mine.....177
Alpena, Cement.....223
Antrin Iron furnace..... 86
Antoine Ore Co..... 49
Anvil mine..... 78
Aragon mine..... 39
Arcadian mine.....140
Armenia mine..... 62
Ashbed mine.....191
Ashland mine..... 75
Atlantic mine, copper.....156
Aetna Cement.....233
Aurora mine..... 71
Austin mine..... 29
Baird, C. F..... 63
Baltic mine, copper.....148
Baltic mine, iron..... 52
Bancroft, W. C.....200
Bargh, H. F..... 27
Barber, G. S..... 78
Barnard mine, coal.....223
Bay mine, coal.....223
Been, J. T.....131
Bigelow, A. S.....115
Bjork, Arvis..... 63
Blast furnaces..... 85
Bond, William..... 55
Boutell, A. A.....244
Boyle, Fargo.....200
Boyne City furnace..... 86
Brady, Samuel.....204
Brady, S. Howard.....197
Breitung, E. N..... 36
Bristol mine..... 63
Bronsom, cement.....233
Brown, E. F..... 45
Brown, Lincoln..... 86
Brotherton mine..... 83
Building stone..... 243
Burrage, A. C..... 142
Cairns, F. I.....210
Cake, W. A.....119
Calumet & Hecla mine.....119
Burt, R. W.....233
Calverley, W. D.....196
Cambria mine..... 38
Carbis, Frank..... 49
Caspian mine..... 52
Carbon mine, coal.....220
Cass mine.....220
Castile mine..... 82
Centennial mine.....135
Central mine, coal.....222
Challenge mine.....165
Champion Copper Co.....141
Champion Iron mine..... 24
Chapin mine..... 39
Chappel & Fordney.....222
Chicago mine..... 75
Childs, W. A.....119
Chipman, J. C. W..... 17
Chynoweth, James.....145
Clark, Wesley.....191
Cleveland-Cliffs Co..... 25
Coal.....217
Cole, Thomas F..... 17
Cole, W. C.....148
Colby mine..... 78
Coggin, F. G., Jr.....144
Conant, H. D.....210
Copper products..... 94
Copper Crown mine.....209
Copper Industry..... 91
Copper Range Con.....146
Copper Range Co.....155
Copper Range R. R.....155
Corrigan, James..... 58
Collick, Alfred..... 27
Consolidated Coal Co.....220
Corryell, Charles.....220
Cooper, J. B.....119
Crystal Falls mine..... 59
Cuddihy, John D.....103
Calumet Iron mine..... 66
Corrigan, McKinney & Co..... 57
Daniel, William..... 94
Davidson, O. C..... 39
Davis, L. M.....220
Davis Exploration..... 75
Demmon, D. L.....110

Dengler, Theo.....156
Deacon, John..... 38
Denton, F. W.....148
Diggens, D. G.....86
Dividends, copper mines..... 95
Dober mine..... 43
Douglass, C. C.....165
Duncan, M. M..... 26
Dunn mine..... 58
Eagle mine, coal.....222
Easle, George J..... 39
Edwards, A. D.....156
Edwards, R. M.....110
Elk Cement & Lime.....233
Elk Rapids Iron Co..... 86
Ellard, H. F..... 75
Elm River mine.....172
Empire Iron Co..... 37
Endicott, G. E.....145
Erie Ontario mine.....
Eureka mine..... 81
Fairbairn, C. F..... 38
Farrell, Austin..... 85
Farwell Cement Co.....233
Fay, H. F.....135
Farnsworth, E. F.....233
Ferris, J. E..... 58
Fitch, Walter.....119
Fitzgerald, E..... 86
Fitzgerald, W. F.....144
Flagg, G. A.....113
Ford, J. C..... 85
Formis, Andre..... 17
Foss, E. B.....220
Franklin mine.....110
Gay, J. E.....138
Getchell, Frank.....181
Geneva mine..... 74
Garritson, G. A..... 85
Gogebic Range..... 71
Goldsworthy, M..... 41
Goodell, R. R.....161
Graff, W. W..... 30
Grand Ledge mine.....229
Graphite 243
Gray, N. W..... 71
Great Western mine..... 59
Grierson, E. S.....119
Haire, Norman W..... 115
Hale, H. V..... 85
Haller, F. H.....115
Hancock City.....107
Hancock mine.....106
Harris, William M.....131
Harris, William..... 55
Hartford mine..... 23
Harris, John L.....103
Hemlock mine..... 51
Hiawatha mine..... 65
Hoatson Thomas.....184
Hollister mine..... 67
Hohl, C. D..... 86
Hooper, George.....206
Hopkins, W. E..... 49
Hubbard, Dr. L. L.....161
Hulst, H. T..... 17
Iron industry..... 9
Iron ore shipments..... 15
Iron ore prices..... 15
Ironton mine..... 78
Ironwood City..... 71
Iron Mountain City..... 40
Isle Royale mine.....157
Jackson, C. R..... 29
Jackson mine..... 32
Jaehnig, Arno.....110
James, S. J..... 41
Jenkins, George.....220
Jewell, Samuel..... 20
Jobe, W. H..... 52
Johnston, E. E..... 86
Johnston, W. H..... 17
Jones, A. G..... 37
Jones, C. J..... 81
Jones, W. E..... 63
Jopling, J. E..... 26
Kearsarge mine.....115
Keese, F. E..... 17
Kelly, William..... 55
Keweenaw Copper 184
Kimball mine..... 62
King Phillip mine.....164
Kohletz, Alfred..... 78
Ladd, W. J.....115
Lake Copper Co.....196
La Salle Copper Co.....113
Lake Superior Iron Co..... 18
Lake Superior Smelting Co...210
Lamb, Chas. L.....200
Lamont mine..... 59
Langdon, N. M..... 87
Lawrence, C. E..... 51
Lawton, C. L.....103
Lillie mine..... 38
Livermore, F. I.....119
Littlefield, J. S.....233
Loretto mine..... 50
Maas mine..... 31
MacNaughton, James 119
Manistique Iron Co.. 86
Mansfield mine..... 44
Marie Charlotte mine..... 36
Mann, R. C..... 26
Mass mine.....200
Maslin, Thomas 135
Mather, Samuel..... 51
Mather, W. G..... 26
Mayflower mine.....145
Menominee Range..... 39
McDermitt, H..... 67

McDuff, P. 244
Michigan blast furnaces..... 85
Michigan College of Mines... 7
Michigan mine, coal..... 223
Michigan Copper mine..... 204
Michigan Iron Co..... 86
Michigan smelting plants..... 210
Mikado mine 83
Mineral Mining Co..... 47
McKeever, R. T..... 155
MacLean, John H..... 17
Miskwabic mine..... 190
Mitchell, Pentecost..... 17
Mitchell, W. W..... 86
Mohawk mine..... 181
Morse, F. A..... 85
Moore, W. H..... 75
Morgan, J. D..... 36
Moro mine..... 30
Munger, C. A..... 51
Munroe mine 67
Munroe, W. G..... 45
Naniamo mine..... 47
Nelson, W. H..... 87
Negaunee mine..... 28
Newhope mine..... 229
Newport mine 76
Noetzel, C. L..... 138
Northern Coal Co. 224
Norrie mines..... 72
O'Brien, T. J..... 86
Ogden mine..... 33
Old Colony mine..... 144
Oliver Iron Mg. Co..... 16
Omego Cement 234
Oneco mine..... 144
Ontonagon County..... 195
Osceola mine 115
Oswald, E. J..... 58
Pabst mine..... 72
Paine, W. E..... 148
Pascoe, P. W..... 36
Peerless Cement Co..... 223
Peninsula Cement..... 233
Penn. Iron Mg. Co..... 54
Pere Marquette Coal..... 221
Persons, Geo. R..... 34
Peterson, I. O..... 110
Pewabic mine..... 45
Phoenix mine..... 188
Pickands, Mather & Co..... 51
Pike mine 80
Pike, R. D..... 80
Pioneer Iron Co..... 85
Portage Entry Sandstone quarries 243
Pittsburgh & L. Angeline Co.. 34
Portland Cement 233
Prince, A. S..... 200
Pryor, R. C..... 196
Puritan mine 74
Quincy mine..... 100
Ramsay, J. D..... 119
Randall, R. M..... 220
Rapson, Thomas..... 181
Reed, Frank 226
Reed mine..... 226
Reeder, J. T..... 118
Republic mine..... 36
Republic Iron & Steel Co..... 38
Rhode Island mine..... 142
Rice, J. H..... 196
Richards, J. W..... 58
Regorth, J. R..... 27
Richmond mine 37
Riverton mine, iron..... 43
Riverton mine, coal..... 222
Roberts, F. C..... 53
Robert Gage Coal Co..... 228
Rough, J. H..... 26
Rowe, W. H..... 210
Rust, E. G..... 86
Ryan, J. A..... 41
Saginaw Coal mine..... 221
Saginaw Mining Co..... 63
St. Mary's M. L. Co..... 161
Salsbury mine, iron..... 30
Salt 213
Salzbury mine 223
Schaeffer, C. H..... 86
Seneca mine..... 190
Shiawasse 223
Shea, J. D..... 81
Shearer, B. S..... 181
Shields, Robert H..... 142
Snadden, John..... 186
Shields, John C..... 186
Sliney, D. J..... 17
Sly, Homer..... 223
Smith, Chas. (Hon.)..... 119
Smith, Fred (Copper)..... 138
Smith, Fred 86
Smith, Will J..... 181
Smith, W. P..... 218
Smith, Russel..... 181
Sheadle, J. H..... 26
Shaw, Quincy A..... 119
Somers No. 1..... 220
Somers No. 2..... 220
Somers No. 3..... 224
Somers James..... 220
South Jackson 32
Spring Lake Iron Co..... 85
Stackhouse, Powell..... 55
Stackpole, Henry 171
Standard No. 1..... 220
Standard No. 2..... 220
Stanton, J. R..... 156
Stanton, Frank McM..... 156
Stanwood, A. G..... 161

Stanwood, Frederic.. 148
Stevenson, Andrew 219
Stebansky, Henry.....204
Sunday Lake mine..... 84
Sullivan, F. J..... 71
Superior mine.....165
Sutherland, D. E..... 71
Stevenson mine 32
Tamarack mine 130
Tecumseh mine 114
Thayer, Nathaniel.....161
Thebo, Joseph 210
Trebilcock, William..... 21
Tregembo, John..... 34
Trevarthon, W. J..... 58
Tilden mine..... 73
Thompson, J. R..... 76
Todd, W. R.....101
Tobin mine..... 58
Toledo Cement.....233
Toms, Elijah 24
Towne, C. D..... 86
Traders mine 49
Trimountain mine.....153
Truscott, Harry..... 55
Uncle Henry mine.....221
Uren, W. J.....131
Van Dyke, George..... 44
Van Orden, F. L.....171
Van Orden, W. C.....171
Veale, W. C.....115
Verona Mining Co..... 83
Victoria mine.....206
Vivian mine..... 53
Vulcan mine..... 54
Wade, J. H..... 26
Wade, C. F.....233
Waller, George.....223
Walters, Thomas 34
Walton, C. E..... 85
Ward, J..... 57
Watkins, W. L.....233
Wenona mine.....228
What Cheer mine.....229
Winona mine.....167
White Cement 233
White, H. W.....233
Whittle, Thomas.....103
Wing, L. M.....233
Wilcox, J. M.....200
Wildey, E. S.....213
Wilkins, Wm..... 81
Woodworth, G. L..... 67
Wolverine, Nos. 1, 2 and 3....222
Wolverine Copper mine.....138
Wright, C. A.....184
Wright, C. A., Jr.....184
Wright mine.....229
Wright, Eban.....229
Williams, R. C.....243
Wykoff, N. J.....243
Wyandotte mine.....170
Wyandotte Cement.....233
World's Iron Ore Reserves... 14
Yale mine 81
Youngs mine 50
Young, G. W..... 50
Yungbluth, A. J..... 26
Yung, E. P.....220

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